ACTA UNIVERSITATIS SZEGEDIENSIS

SECTIO SCIENTIARUM NATURALIUM /PARS BOTANICA/

CURAT: P. GREGUSS

ACTA BOTANICA

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S Z E G E D, (Hungaria)

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CURAT: P. GREGUSS
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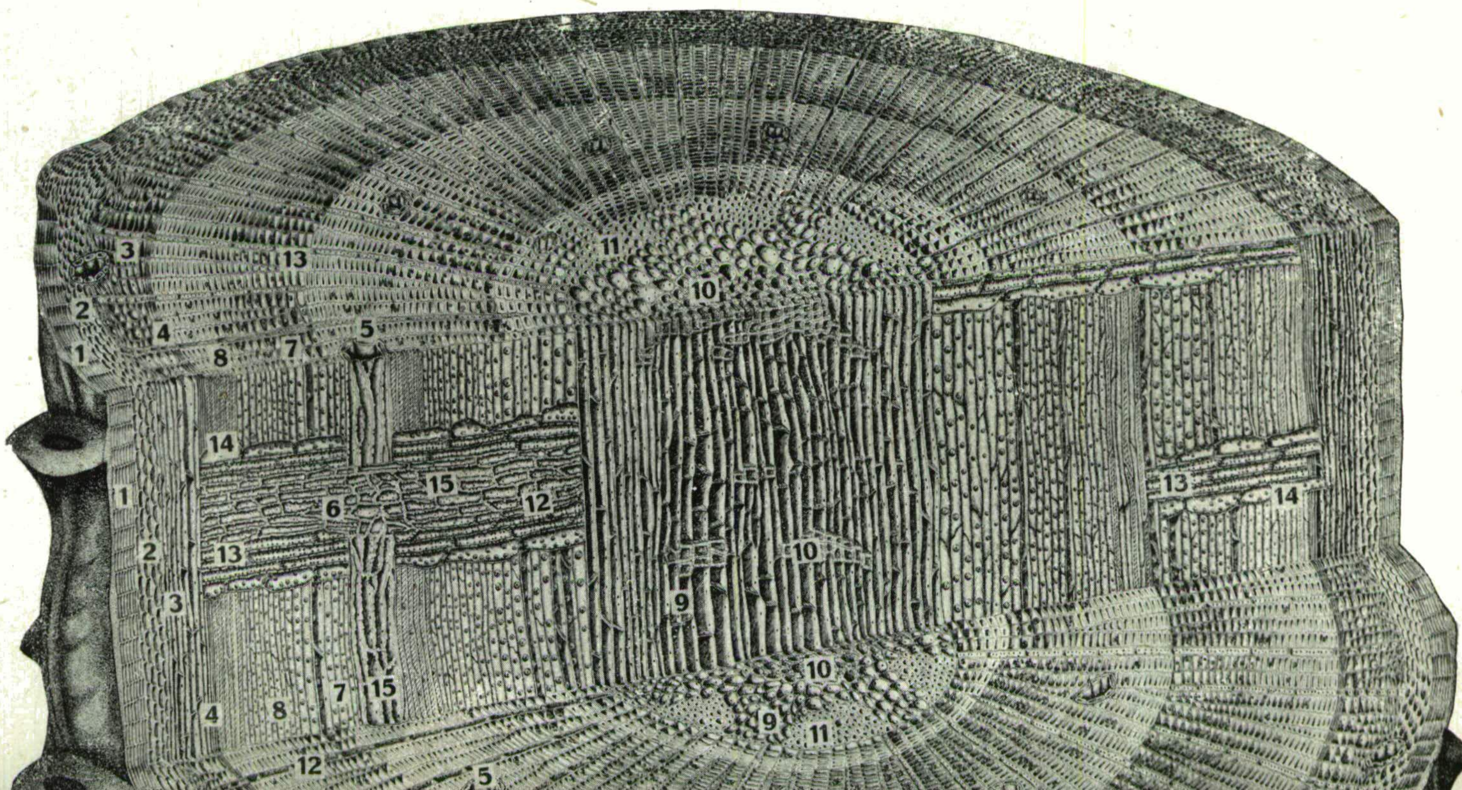
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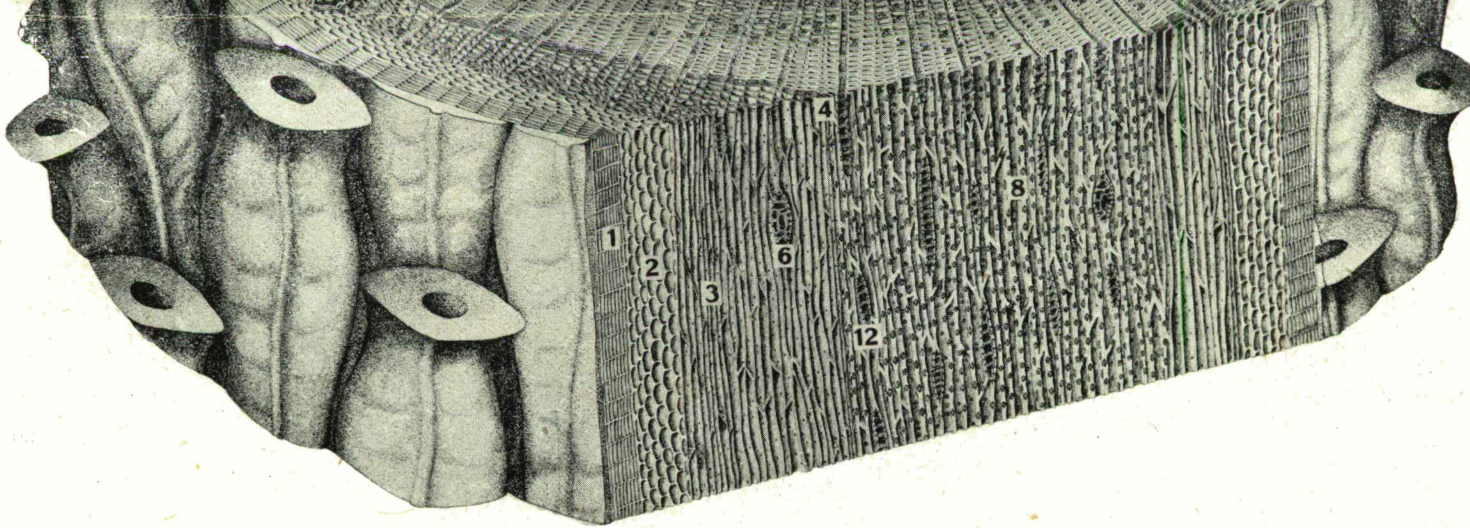

The internal structure of a three years old twig of Common Spruce

A drawing from the author's *(P. Greguss)* work: *Xylotomic Identification of the Conifers* under publication. Under my direction and supervision delineated by Miss *G. Gosztonyi.* **1.** cortex, **2.** cortex parenchym, **3.** inner bark, **4.** cambium, **5.** vertical resin-ducts, **6.** horizontal resin-ducts, **7.** earlywood, **8.** latewood, **9.** pith, **10.** pith sclerenchym, **11.** primary wood, **12.** ray (tang. s.), **13.** thick walled raycells, **14.** marginal cells=ray tracheids, **15.** thick walled resinducts cells.

ACTA UNIVERSITATIS SZEGEDIENSIS
SECTIO SCIENTIARUM NATURALIUM (PARS BOTANICA)
CURAT: **P. GREGUSS.**
A SZEGEDI EGYETEM KÖZLEMÉNYEI
A TERMÉSZETTUDOMÁNYI SZAKOSZTÁLY NÖVÉNYTANI KÖZLEMÉNYEI
SZERKESZTI: **GREGUSS PÁL.**
SZEGED, (HUNGARIA) **BAROSS U. 2.**

Tomus IV. Fasc. 1—6. 1949 IV. kötet 1—6. füzet

Xylotomic investigation of some uncommon tropical coniferous genera.

By PAUL GREGUSS.

I wrote about some 28—29 coniferous genera (including *Ginkgo* and *Ephedra*) in my paper: *Identification of the most important genera of firs based on xylotomy* published in Volume III. of *Acta Botanica* 1948. Meanwhile I have been able to procure test-material of some more uncommon mainly tropical fir-types. I describe here further 19 genera, thus in these two papers about 47 genera are described. The remaining 2—3 types will be dealt with shortly. Thus all the coniferous genera, embracing about 300 species, will be described in my work, to be published within a short time under the title: *Xylotomic Identification of the Conifers.*

PINACEAE

1. **Keteleeria Davidiana** Beiss.

Plate 1.

Native of China. Test-material by courtesy of Institute of Botany, Shanghai.

C. 1., 2.* Picture of transverse section somewhat different from other firs. Boundary of annual ring remarkably sharp, since the very thickwalled late tracheids are followed by widelumened thinwalled quadrangle tracheids. The late tracheids are square or rather rounded, their lumen is here quite small, dot- or slit-like. Slow transition between early and late wood, though the more thick-walled tracheids sometimes occupy ¾ part of the annual ring. The tracheids vary in size (25—40 μ); among the larger ones there are sometimes quite small-lumened tracheids. The tracheids running along the rays are for the most part more voluminous as those in the centre of the ray field. The rays are running relatively densely, 1—10 tracheids wide. For the most part they contain a black or darkcoloured resinous substance. Tiny pits appear on the horizontal walls of the rays, scattered or alined along the tangential wall. Only sparse wood parenchyma, more in the early wood or along the boundary of the annual ring at the beginning of the early wood. Occasionally 3—4 parenchyma are alined along the boundary of the annual ring. About 2000 tracheids belonging to 1 mm².

* The abbreviations stand for: **C.** for Cross-section, **T.** for Tangential-section, **R.** for Radial-section, and the numerals for the numbers of the photographs.

T. 4. Rays 1—2 seriate. Some higher rays sometimes 5—6 cells high biseriate. Rays height 1—34 cells. Transverse section of cells circular or slightly elliptic, height 21—26 μ,with 14—20 μ. Walls relatively thick. Tangential walls very variably pitted, the walls showing the most different characters, sometimes they are even sieve-like. Pits visible also on radial walls. Tracheids smooth-walled. At the most a few bordered pits even in late wood. Occasionally some oblique thickenings or striations. 2—3 larger pits present on the horizontal wall of the wood parenchyma cells, and a few circular simple pits on the radial wall. There are also pits on the tangential wall. Relatively very few wood parenchyma, 1—2 in a cross section. Pits small in wood parenchyma, circular or elliptic. 35—40 rays and 290—300 ray cells belonging to 1 mm².

R. 3. The tangential section reminds us of the structure of the *Abies* and of the *Cedars;* the same applies on the whole for the radial section. Tracheid-walls smooth. Bordered pits in early wood in one tracheid width usually in pairs and then the contact line is vertical. Other pits are scattered and irregularly situated on the tracheid walls and have circular apertures. The rays comprise only thickwalled parenchyma cells. Outer walls of marginal cells strongly undulating, so that nearly each marginal cell projects hill-like over the underlying ray cell. This structure reminds somewhat of the *Larix* and of the *Cedar*. Shape of cells inside the rays elongated hexagon or oblong. Tangential walls join the horizontal walls under various angels. Many simple pits on the valls of the rays, equally 3—5 simple pits on the tangential walls. Irregular pitting on the radial walls, pits small and circular, size 4—6×6—9 μ, about ¼ of the cell-width. A ray cell may comprise sometimes 2—3 rows of pits in a cross-field, while some higher marginal cells may contain 4—5 pits vertically alined. Parenchyma cells only present immediately or close to the boundary of the annual ring. Several simple vertically scattered pits visible on their radial walls. Pits present on the horizontal wall too, and on the tangential wall as well. At the contact of the tangential and horizontal walls, a mostly broad plate is formed, which is usually triangular. Where the two different parenchyma contact, 4—6 quite tiny pits may be in each cross-field (see picture).

TAXODIACEAE

2. **Athrotaxis selaginoides** Zucc.

Plate 2.

Native of Tasmania. The investigated material by courtesy of Division of Forest Products, Melbourne.

C. 1., 2. The growth rings are 40—70 cells, sometimes 2—2½ mm wide. Sharp boundary of the growth rings, the tracheids of the late wood thickwalled (3—6 μ), narrow-lumened, and considerably flat in radial direction (10—15 μ). Walls of spring tracheids thin (1—3 μ) their transverse section square, pentagonal, or multangular. The picture of its transverse section reminds of *Abies alba* and of *Larix*. The spring tracheids may be of 60—70 μ in radial direction, while the late wood tracheids may only have 10—15 μ. The rays are running in radial direction in a width of 2—20 tracheids. Horizontal walls generally smooth, with sparse pits, but the radial walls are entirely smooth and no pitting perceivable in them. Parenchyma rather frequent, scattered, prominently in late wood. Pitting on the horizontal walls of the parenchyma present, at the most a delicate thickening. 1300—1350 tracheids belonging to 1 mm^2.

T. 4. The walls of the tracheids in the tangential sectiou usually smooth, but traces of spiral striation are well perceivable in most tracheids of the late wood. The striations run in smaller or larger distance in spiral line, well observable with the help of the micrometerscrew. Only sparse pit borders on the walls of the early tracheids, but more recurrent in late wood. They are relatively small (6—7 μ), only one-third of the width of the tracheids. Shape of the pits not always regular circle, mostly irregularly outlined, aperture extending over the border, the opposite pits sometimes crosswise situated. Rays usually uniseriate, exceptionally they may be in their midth biseriate in a height of 1—2 cells. Height 1—14 cells, I have never found higher ones. The cross section of the ray cells was for the most part circular (diameter: 30 μ) or slightly elliptic (25×30 μ), the marginal cells occasionally somewhat higher and triangular. No pitting pereeptible on the tangential walls. Parenchyma abundant; width 25—30 μ, mostly resinous. Occasionally small and scattered pits on the tangential walls of the parenchyma. Pitting hardly present on the radial walls. 50 rays and 230 ray cells belonging to 1 mm^2.

R. 3. Radial walls of the tracheids smooth. Pit borders in the late wood in solitary rows, but on the walls of the spring tracheids sitauted in pairs, or alternately close to one another. Diameter of the pit borders 10—15 μ. Border not regular circular, sometimes irregular, as if squeezed. Aperture circular or slightly extending over the border in which case the slit hardly reaches the boundary of the border, but occasionally it may extend beyond it. Sometimes a complete row (10—15) trabeculae is observable at the same height in the tracheids. The rays consist of pareuchyma cells. Their horizontal walls are smooth or delicately warty; only sporadical pits, even these more primary thikenings. The tangential walls contact rectangularly or in slightly acute angle with the horizontal walls; indentures not perceptible. There were 1—2 relatively small simple pits side by side in each crossfield, while the marginal cells may comprise 3—4 pits, in which case these may form a square. Size of pits 6×9 μ, but sometimes they are of procumbent or slightly oblique elliptic shape. Parenchyma cells rather frequent, width 25—35 μ. Their tangential walls smooth or with primary thickenings. Distinct pitting unobservable. Scattered small circular pits on the radial walls. Wood-structure reminds of *Thuja* and *Chamecyparis*.

3. **Glyptostrobus pensilis.** (Abel) K. Koch.

Plate 3.

Native of South-China and the test-material by courtesy of Institute of Botany, Shanghai.

C. 1., 2. Annual rings sometimes narrow 5—20—30, sometimes

70—80 cells broad. Distinct boundary of annual ring, marked sometimes by 1—2 flattened cell-rows of the late tracheids, but sometimes the broad late wood occupies a considerable part of the annual ring. Cells of early wood quadrangle, those of late wood flatteend oblong. Their sizes in early wood 25—30×35—40 μ and in late wood 12—15×25—30 μ. Occasionally the horizontal wall of 1—2 wood parenchyma is visible in the annual ring, with 2—8 simple pits on the horizontal wall, which are usually biseriate. Rays alined in a width of 1—8 or 12 tracheids. A few simple pits perceptible on their horizontal wall. Tangential walls mostly obliquely inclined to the radial walls. 2500—2600 tracheids belonging to 1 mm^2.

T. 4. Tangential wall of tracheids smooth. Many bordered pits on the late tracheid-walls; these are relatively small (6—8 μ), apertures like a small stick, and they do not extend to the rim of the borders. Slit almost vertical. Rays 1—18 cells high. Through *Peirce* records up to 30 cells high, I could not detect such high rays. Their cross-section more vertical ellipse (21—26×10—12 μ). The solitary ones are almost bobbin-like. Also the marginal cells are considerably elongated. The higher uniseriate rays may be exceptionally two cells broad in the centre. Relatively thick horizontal walls. Wood parenchyma cells frequent enough. 3—4 nodular thickenings on their horizontal walls. Some of the beads may be considerably larger. Sometimes only 1—2 simple pits on the horizontal walls. 85—90 ray cells and 330—340 ray cells belonging to 1 mm^2.

R. 3. The walls of tracheids are smooth. Pit-pairs frequent in the early tracheids, sometimes alined in pairs on the radial walls. Occasionally bordered pits follow in solitary rows. The border of the pits more procumbent ellipse, and the bars of *Sanio* beside them are well visible. Pitting of the bordered pits reminds to some extent of that of the *Larix*. Size 16—18 μ. Wood parenchyma cells quite frequent, elongated, narrow (12 μ), with several circular simple pits on the radial walls. No such marked pittings were perceptible on the tangential walls.

Horizontal walls relatively short, with one or two pits. Rays embracing only parenchyma cells. Outer wall of marginal cells slightly undulating and very thin, the inner walls thicker, having scarce primary thickenings. Sometimes even the simple pits are well visible. At the contact of the tangential and horizontal walls the tangential wall is sometimes triangularly widening, consequently indentures absent. Radial walls are thin, with 1—3—4 simple pits in a cross-field, in the inner ray cells in twos side by side, in the marginal cells mostly in fours or in twos one above the other, sometimes, however, there are 6, exceptionally even 8 simple pits in a cross-field. Size 6—7 μ. The surface of the horizontal wall is not always even, sometimes there may be smaller or larger warts or protrusions. Tangential walls mostly smooth, sometimes with 1—2 nodular thickenings. 8—10 (5 pairs) simple pits may occur in the cross-field of the one cell high rays. Trabeculae rather frequent in the tracheids, sometimes they occur in 8—10 horizontally alined tracheids and in the same height.

CUPRESSACEAE

4. **Arceuthos drupacea** Antoine.

Plate 4.

Native of Asia Minor and Greece. Test-material came from the mountain Olimpus.

C. 1., 2. Annual rings vary in thickness in the section which was made of an about 10 year old twig. Some are 20, some 30—35 tracheids wide. Boundary of annual ring slightly undulated and sharp enough. This sharpness is caused by the contrast of the completely flattened late tracheids and of the square shaped early tracheids. Size of the early tracheids 16×18 μ and of the flattened late tracheids 6—8 μ. The lumen of the late tracheids sometimes appears only as a slit. The wall of the late tracheids is 2—3 μ thick and that of the early tracheids slightly thinner. The 5—6 rows of the late tracheids is sufficiently separated along the boundary of the annual ring. The shape of the tracheids is either 4—5—6 angular, or irregular, but not rounded. In the annual rings occasionally wood parenchyma cells are perceptible, on the horizontal walls of which dot-like or elongated pits are visible. Their walls are quite thin. The rays run in radial direction, but slightly winding in a width of 1—10—15 tracheids. Several simple pits appear on their horizontal walls, and there are 1—2 nodular thickenings on their tangential walls. Some 2400 tracheids belonging to 1 mm^2.

T. 4. Tangential walls of the tracheids are smooth. There are only few scattered bordered pits on the tangential walls of the early tracheids, and quite a lot on the tangential walls of the late tracheids. Diameter 10—12 μ. Aperture circular or slightly oblique elliptic. Rays generally10—12, sometimes 1—22 cells high. Cross section more circular or slightly elongated elliptic. The rays may contain ray cells of varying size, of which the smaller ones are 10—12 μ and the bigger ones 22—24 μ high. The solitary cells are, however, 30—40 μ high and 10—12 μ wide. Their tangential walls are smooth, but there may be horizontal and net-like thickenings on it, which means that they have Juniperoid thickenings. Parenchyma are present, the parenchyma cells are 10—15 μ wide. The horizontal wall is either smooth or with 2—3 nodular thickenings. There are also pits on the radial walls of the parenchyma. The horizontal wall of the ray cells is much thicker than the tangential wall. The pitted thickening is well visible on the horizontal wall. Pits are present also on the radial walls. Some 150 rays and about 370 ray cells belonging to 1 mm^2.

R. 3. The wall of the tracheids is here also smooth, but the walls of the late tracheids sometimes show a sharp striation. Bordered pits are in one row and scattered on the walls of the tracheids. size 12—15 μ Aperture circular. The border of the bordered pits almost touches the wall of the tracheids. The rays contain only parenchyma cells. Their horizontal walls are relatively thick, with rather many simple pits. The walls are at some places thicker, elsewhere quite thin. The tangential wall is either vertical or somewhat obliquely inclined to the horizontal wall. The wall is smooth or with 1—3 nodular thickenings. Pist are present also on the radial walls. Through these are well translucent the oblique apertures of the underlying bordered pits of the tracheids. Size of the borders 5—6 μ. 1—3 simple pits are present in each cross-field, while some of the higher marginal cells contain 4 pits. The pits are mostly arranged one above the other, and in the marginal cells, if they contain 4 pits, they form a square. At the contact of the tangential walls and of the horizontal walls the indentures are well perceptible.

The parenchyma cells are considerably elongated, their horizontal walls are smooth, simple pitted or bead-like thickened. Several tiny simple pits appear on the tangential and radial walls. There may be 4—7 small circular and elliptic simple pits in a cross-field at the contact of the ray cells and of the parenchyma cells.

5. **Callitris rhomboidea** R. Br.

Plate 5.

Native of Queensland and of New South Wales. Test-material by courtesy of Division of Forest Products, Melbourne, Australia.

C. 1., 2. Boundary of annual ring quite indistinct, hardly perceptible. The boundary of the annual ring is at the most marked by some shorter tracheid rows. There is hardly any difference in the size of the early and late tracheids. The size of the larger tracheids may come to 50—70×40—50 μ, while the diameter of the late tracheids is more 35—40 μ. Size of the tracheids in the annual ring is varying. Quite small tracheids are possible beside quite large ones. Their cross section is rounded square, multangular or irregular. Walls are 3—4 μ thick. The rays run in radial direction 1—10—15 tracheids wide. They contain a dark, resinous substance. There are scattered parenchyma cells among the tracheids, sometimes crowded into shorter or longer terminal plates. Their walls are thin 1—1½ μ, their horizontal walls entirely smooth with primary thickenings. No pitting is visible on the horizontal walls of the rays. About 700 tracheids belonging to 1 mm².

T. 4. The walls of the tracheids are smooth, but sometimes oblique striation is perceivable in the late tracheids. Only few bordered pits are present on the tangential walls of the tracheids, but it may be assumed that these got in this side owing to winding. Rays 1—34, but usually 8—10 cells high. The ray cells are 15—20 μ high, and 16—17 μ wide, thus ± square. The marginal cells may be even slightly higher. Usually they are uniseriate, but some rays are biseriate. F. i. the five inner rows of a seven cells high ray may be biseriate. The tangential wall is quite smooth, similarly the horizontal and radial walls respectively. Parenchyma cells not unfrequent and they contain a resinous substance. Width 28—30 μ. Their horizontal walls are quite smooth and their tangential wall is also smooth with primary pitting. Only very sparse circular pits with a diameter of 3—4 μ is visible on it, but these probably constitute the bordered pits of the sublying tracheids. About 25—30 rays and some 220—240 ray cells belonging to 1 mm².

R. 3. The walls of the tracheids are smooth, but sometimes widely running oblique striations are perceptible in the late tracheids. Bordered pits solitary and scattered, but there may occur pit-pairs on the walls of the broader tracheids, beside which the bars of Sanio are quite well perceptible. Pit pairs either in a fair distance from each other or densely arranged, in which case they contact vertically. There is ample space for two 15—15 μ wide pits in a 70 μ broad tracheid. Aperture circular or obtuse elliptic, but sometimes it may extend over the border. Sometimes the outlines of the torus are also well visible. Sometimes a characteristic design is visible on the borders of the pits. This design is produced by radially arranged dots or by streaks caused by the adhesion of these dots (see drawing). The rays contain only parenchyma cells. Their three walls are entirely smooth and thin. Sometimes primary pitting occurs on the horizontal walls. The tangential wall is mostly vertically inclined to the horizontal wall, without any indenture at their contact. There are 1—2 pits in a cross-field, and 4—6 pits in the marginal cells. Size of the apertures 6—7×3—4μ, and that of the borders about 12 μ. These pits are really on the walls of the tracheids, but their outlines are translucent through the thin walls of the ray parenchyma. The horizontal, tangential and radial walls of the parenchyma cells are quite smooth, but the small, 8—9 μ wide bordered pits of the sublying tracheids are translucent through the radial walls. At the contact of the longitudinal parenchyma cells with the ray cells pitting is absent (see picture), which proves that there is no pitting present either on the radial walls of the ray cells or of the parenchyma.

6 **Callitropsis araucarioides** Compton.

Plate 6.

Native of New Caledonia. The examined material came also from New Caledonia. As the literature knows from *Callitropsis* only the species *Callitropsis araucarioides Compton,* there is no doubt that the test-material which was received under the name of *Callitropsis Compton,* must be identical with *Callitropsis araucarioides Compton.*

C. 1., 2. The single annual rings in the cross-sections are hardly to distinguish, but they vary in width. Some have 4—5, others 20—30 tracheids in width. Almost no transition from spring wood into late wood. The spring tracheids are, however, in some annual rings much larger than in the late wood. The tangential width of the tracheids was 27—45 μ, while the radial size of the late tracheids was 13—15 μ, consequently much flatter. Here the inside of the tracheids appears as a narrow aperture. The cross-section of the tracheids was rounded square or circle, the tracheids along the rays were sometimes wider than the others. The number of tracheids between the two rays, running in radial direction, was 4—20—25. Very seldom 1—2 simple tiny pit-like points could be observed on their horizontal, walls, but the radial and tangential walls were quite smooth. Woodparenchyma was very sparse; scarcely 1—2 in a cross-section (see picture), and even these were resinous. 1250—1300 tracheids belonging to 1 mm^2.

T. 4. Height of rays 1—10—12 cells, though *Peirce* records in his above mentioned paper 24 cells; however, I have not found in my material more thon 12 cells. Generally they were uniseriate, exceptionally, however, in a hight of 1—2 series of cells they may also be biseriate. Their walls are rather thin, and there are no pits either on the horizontal or on the radial walls. The tangential section of the ray cells is circular, or procumbent short-elliptic, but the marginal cells are somewhat elongated. Height 16—21 μ, width 15—20 μ. Bordered pits in the tracheids scattered or uniseriate. Diameter of the borders 10—12 μ. Aperture short-elliptic, border of the torus somewhat undulating. Pits sometimes extending over the border, the tracheid walls are then, particularly in the late wood, characteristically striated. Striations crosswise. I have found only one parenchyma in the examined section; its horizontal and radial wall was entirely smooth.

R. 3. Tracheid walls smoth. Usually only one solitary bordered pit on the tracheid walls of the spring wood, but pit-pairs are also frequent, and then the contact line is vertical. At some places the bars of Sanio were rather distinct. Pits in late wood mostly solitary and scattered, but sometimes they were pretty close by one another. Diameter of the pit borders about 15 μ, i. e. somewhat larger than those of the tangential walls. I have not found but few, 1—2, resinous longitudional parenchyma in the examined section. The horizontal, tangential, and the radial walls were extremely thin and quite smooth.

The rays contained only parenchym cells, even the most careful examination failed to exhibit ray tracheids. Thus I could not ascertain the observation of *Peirce* that the heartwood contained ray tracheids. The marginal cells may occasionally be 32—35 μ high. The tangential walls were mostly vertically situated to the horizontal walls, and were entirely smooth and thin. The horizontal walls were also thin, but at some places they were still thinner, without any conspicuous pits. No zig-zag thickenings at the contact of the tangential and horizontal walls. Pits in the cross-field either solitary or double, but the marginal cells may comprise 3—4 pits per cross-field. Pits elliptic, their longer diameter 6—8 μ, their shorter one 3—4 μ. Pits sometimes with distinct borders. This originates, however, in the pit borders of the tracheid walls. Occasionally one bigger pit occupied the place of 2 smaller pits, in a horizontal or vertical position. On another occasion the entire cross-field was filled by one large pit, but not to such an extent as in *Pinus silvestris* or *Dacrydium Fränklini*. No pits on the horizontal walls.

7. Diselma (Fitzroya) Arscheri Hook. fil.

Plate 7.

Native of Tasmania. Test-material by courtesy of Division of Forest Products, Melbourne, Australia.

C. 1., 2. Annual rings relatively very narrow. Some annual rings are hardly 4—5, most of them 8—10 and even the widest hardly 10—12 tracheids wide. I could not find a wider annual ring in the examined small wood sample which was some 50 years old. Boundary of annual ring slightly undulating and indistinct. Boundary made distinct by one or two cell rows of the late tracheids. These two extreme cell rows of the late tracheids are slightly flattened (6—8×18—20 μ), but there is no difference in the thickness of the wall between these and the early ones. Size 18—20×20—22 μ. Cross-section 4—5—6 angular, or irregularly shaped. Some of the tracheid rows considerably broader than the adjacent ones. Most of the tracheid rows may be followed up through several annual rings. Occasionally parenchyma cells perceptible in the annual rings, whose tangential walls are unpitted, or showing nodular thickenings. Rays running in radial direction, some traversing 20—25—30 annual rings. Rays relatively densely arranged, distance 3—4 or 10—14 rows. Pits usually absent on horizontal walls of ray cells, and a few simple pits only sporadically present. Ray cells relatively short, sometimes only one ray cell per annual ring, signifying that the length of a ray cell corresponds to 4—5 tracheids in width. 5000—5200 tracheids belonging to 1 mm².

T. 4. Rays 1—6—8 cells high, bot nowhere higher, though *Peirce* reported 12 cells high rays. Cross-sections of ray cells mostly elliptic, ovate, while the marginal cells are more coniform. Ray cells not equally high, size varying between 26×18 and 12×12 μ. There were high and lower ray cells in the same ray. A high ray cell was sometimes followed by a lower one, then again by a higher one, and so on. A great many rays were one or two cells high. Rays relatively dense.

Many wood parenchyma present. Their tangential walls prominently smooth, and small circular or elliptic simple pits, appearing on the walls in smaller or larger groups, were only very seldom perceptible. Their horizontal walls were only rarely smooth, usually they showed tiny, nodular thickenings. The simple pits on the radial walls were more distinct. Obliquely inclined striations present in the late tracheids, but it is not a genuine spiral thickening. Juniperoid thickening was found, which extended over the whole ray cell on the tangential wall of the ray cells. 140—150 rays and 350—360 ray cells belonging to 1 mm².

R. 3. Radial walls of the tracheids smooth. Shape of the bordered pits varied according to the width of the tracheids. Borders of the wider tracheids circular, or most rarely slightly elliptic, those of the late tracheids more vertical ellipse. Borders not only circular, but sometimes irregularly shaped, aperture corresponding to the shape of the borders. The boundary of the torus was quite distinct around the aperture. Size 10—11 μ. Simple pits on the tangential walls of the parenchyma cells circular or procumbent elliptic, scattered, or in groups of 3—4 pits. Horizontal wall may be smooth, occasionally with 1—2 pits. Still fewer pits on the radial walls. Rays 3—5 cells high and comprising only parenchyma cells; shape oblong or very elongated sexagon. Tangential walls almost vertical to the horizontal walls, occasionally with nodular thickenings, so that they remind us also in this regard of *Juniperus*. At the contact of these walls indentures absent. Horizontal walls almost smooth with smaller or larger warts, but sometimes with distinct simple pits Number of simple pits varying in the cross-fields. 2—3—5 in the early tracheids and only very seldom regularly arrayed, usually irregularly arranged. Size 5—6 μ .Number of pits in the marginal cells slightly larger, sometimes 4 pits vertically alined. Pitting in the cross-field of 1 cell high rays generally richer. Here 5—6, exceptionally 7 simple pits present in a cross-field. Pits on the radial walls of the rays occasionally distinctly perceptible, or sometimes it seems as if the pits of the tracheids, which are arranged behind them, would be translucent through the thin cell wall. Beside the pits occasionally crescent-like borders. Much smaller, but somewhat more numerous simple pits at the contact of the ray cells and of the parenchyma cells. Despite of most careful investigation I could not detect ray tracheids, though *Peirce* recorded also such ray tracheids.

8. **Fitzroya patagonica** Hook.

Plate 8.

Native of Chile and of the environment of the Andes. Test-material by courtesy of Forstbotanisches Institut, Tarandt, Germany, of Chilean origin.

C. 1., 2. The annual rings vary in thickness. Some are 8—10, some 18—20 tracheids wide. Boundary of the annual ring is slightly undulated and sharp. This distinctness of the boundary is caused by the contrast of the much larger and thinwalled early tracheids and the few-seriate and thickwalled late tracheids. The cross-sections of the tracheids are mostly square. The early tracheids are more square, and their radial extension is 45—50 μ, their tangential width 35—40 μ, and the tangential width of the last late tracheids is 35—40 μ, and their radial thickness 12—15 μ. The walls of the late tracheids are 5—6 μ thick and that of the early ones 1½—2 μ. The lumen of the most extreme thickwalled tracheids, which are arranged along the boundary of the annual ring, appears only as a narrow streak. There are only sparse parenchyma cells among the tracheids, the diameter of which is much smaller than that of the neighbouring cells. Small pitting is visible on their horizontal walls. The rays run in radial direction but slightly winding, and they refract slightly at the boundary of the annual ring. Seen from above several simple pits appear on their horizontal walls, and on their radial and tangential walls as well. About 1700 tracheids belonging to 1 mm².

T. 4. The wall of the tracheids is smooth, though sometimes spiral thickenings appear on the walls of the late tracheids, which have an oblique orientation and which are recurrent at a certain distance. This spiral line sometimes may be followed in the tra-hceids in longitudinal direction. Sometimes, however, these lines run in twos and parallel, thus the traces of the spiral thickenings are quite distinct. Bordered pits on the walls of the tracheids are very rare, size 12—13 μ, aperture 3×5 μ; the outlines of the torus are well visible around the aperture. Bordered pits scattered and more frequent in late wood than in early wood. Radially arranged dots may be perceived in the bordered pits on the tangential walls of the tracheids.

Rays 1—10 cells high; I could not detect higher ones, though the material came from a several years old stem. Cross-section of the ray cells is circular or vertical elliptic, that of the marginal cells very much elongated oval. Ray cells vary in hight, some are 20, some 32—34 μ high, a few solitary cells may be 36 μ high. Width in general 14—16 μ. Some 40 rays and about 120 ray cells beloging to 1 mm². The tangential walls of the ray cells are smooth or with primary thickenings, but sometimes also marked simple pits are present on the walls. Simple pits are on the horizontal walls of the rays, marked pitting is not visible on the thin radial walls.

There are quite a lot of parenchyma cells. Their width may be 32—34 μ, their tangential walls are smooth or nodularly uneven. There are sometimes simple pits on their tangential and radial walls.

R. 3. Commencing spiral thickenings may be observed on the radial walls of the late tracheids. Bordered pits scattered or occasionally densely arranged, but they nowhere contact in a straight line. Size of the bordered pits in the early tracheids 13×16 μ, thus elliptic shaped, while those of the late tracheids are more circular. Consequently they do not extend to the 30—32 μ broad walls of the tracheids. Aperture circular, rim of the torus visible. The borders of the pits are decorated in radial direction by the most manifold designs, some of which may be seen in the drawing (P.). But sometimes the decoration of the borders is not a streak, but dots in radial direction. I could not detect a similar design in any fir yet. The rays are composed only of parenchyma cells. Quite exceptionally very short bordered pitted tracheids may be perceptible on the ray parenchyma which fill the space between the ends of the longitudinal tracheids and of the rays. These may be regarded as ray tracheids since the diameter of their bordered pits is 8—9 μ, while the diameter of the bordered pits of the longitudinal tracheids, which are quite close to them, is 16—18 μ. Some largely elongated ray tracheids may be 12 μ broad and about 100 μ long. These some 100 μ long ray tracheids contact by half bordered pits with the sublying parenchyma cells. There are quite a lot simple pits on the horizontal walls of the ray parenchyma cells, and simple pits are also on the tangential walls. 1—2—3 pits occur in each cross-field, and 4—5 may be present in the marginal cells. Size of the pits 4×6 μ, and they are mostly in the corners. Sometimes a resinous substance accumulates in the ray cells. Longitudinal parenchyma not infrequent. Width 12—14 μ, horizontal walls smooth, or with 1—2 pits; relatively small, simple pits (4—5 μ) are present on their tangential and radial walls.

9. **Fokienia Hodginsii** Henry et Th.

Plate 9.

Native of East-China. Test-material by courtesy of Prof. A. W. Jessep, Melbourne.

C. 1., 2. Annual rings vary in width. Some are 10—15, others 30—50 tracheids broad. Boundary of annual ring uniform and quite distinct. This distinctness is made still more marked by 3—4 flattened rows of the late tracheids, but there may also be 6—8 such flattened rows of tracheids in some annual rings. There is no difference in the thickness of the early and late tracheid-walls. In tangential orientation the tracheids are flattened along the boundary of the annual ring. Size of the late tracheids 18—20×6—8 μ, while the early ones have 26—30×20—22 μ. They are usually quadrangular and vary in size. There are wider and narrower rows of tracheids. Rays running in relatively great distance in radial direction, usually 8—10, sometimes 20—30 tracheids wide. No pitting present on their horizontal walls. Occasionally sporadic wood parenchyma cells in the older annual rings, and their horizontal walls are quite smooth or to a lesser or greater extent warty. There are no pittings on their tangential walls, thus they are also quite smooth or at most delicately warty. Neither are pittings present on the radial walls. About 2400 tracheids belonging to 1 mm^2.

T. 4. Rays mainly 1—2 cells high, more rarely 6—8 cells high. *Peirce* reported 1—24 cells, I could not find a single ray 10 cells high. The cross-sections of the ray cells are slightly elongated ellipses, the marginal cells are somewhat higher than the inner ones. Size 20—22×10—11 μ. The tangential walls of the rays are smooth, or with slight primary thickenings, and the warts form sometimes horizontal lines.

The walls of the tracheids are smooth. There are quite few, or no bordered pits on the tangential walls of the early tracheids, but there are numerous and densely situated bordered pits on the tangential walls of the late tracheids. Usually there is only one bordered pit in one tracheid width, sometimes 2, or quite exceptionally 3 bordered pits may get one beside the other. If they contact, the contact line is straight. The bordered pits densely follow each other in some late tracheids, in which case they are pressed together and similarly to the Araucaria they contact in a straight line. The bordered pits are relatively small; one tracheid-width may suffice for 2 or even for 3 bordered pits. Size 6—10 μ. Parenchyma cells abundant. Their tangential walls very seldom pitted. The simple pits are circular. Their horizontal walls are smooth, or nodularly pitted. There are also pits on the radial walls. If the parenchyma touches the ray cell, there are also pits in the parenchyma, but there are none in the ray cell, which proves that there are no pits on the radial walls of the ray cells. 60—65 rays and 130—140 ray cells belonging to 1 mm^2.

R. 3. The rays comprise only parenchyma cells. They are shaped shorter or longer oblongs, of which the shorter sides curve arclike to the horizontal walls. Their horizontal, tangential and also their radial walls are decidedly smooth. There are 1—2—3 pits in a cross-field, and mostly 3—5 pits in a marginal cell. Size 6—8 μ. The apertures of the bordered pits which are situated below them, are for the most part elongated, somewhat pointed ellipses. (6×3 μ.) Occasionally 6—8, but even 10 pits are present in the cross-field of the solitary rays. Generally there are 6 pits in a cross-field, in which case the pits are arranged vertically in 2 rows.

The walls of the tracheids are smooth. Bordered pits arranged uniseriate, sometimes biseriate. Usually they are sporadic, but sometimes they are so crowded, that when they are situated one above the other, they touch one another with horizontal walls, reminding us of the *Araucarine*. Size 15—16 μ.

Aperture of bordered pits generally circular, and the border is also mostly circular. The tracheids are delicately striated in some parts of the late wood. Striations of two neighbouring walls crossing each other. Bordered pits in such striated tracheids mostly extending over the border. Also trabeculae present in some tracheids arranged in the same height. Parenchyma cells relatively long and narrow (6—8—10 μ), their horizontal walls smooth or pearl-row like, only sparse and scattered simple pitting conspicuous on the radial and tangential walls.

10. **Widdringtonia juniperoides** Endlicher.

Plate 10.

Native of South Africa. Test-material by courtesy of National Botanic Gardens, Kirstenbosch, Newlands.

C. 1., 2. Annual rings varying in thickness. Some are 10—15, some 50 tracheids broad. The thinner walled early tracheids pass gradually into the thicker walled and narrower lumened late wood. The tracheids along the boundary of the late wood are flattened and narrow lumened (10 μ). Cross-section of early tracheids mostly square, but in the annual ring more varying, sometimes multangular. Some rows of tracheids are strikingly broader than the others (20—24 μ). These wider rows are mostly running along the rays, but sometimes somewhat distanciated. Generally speaking the cross-sections of the tracheids do not present a uniform appearance. Boundary of the annual ring sporadically undulated, in some places rather hollow. Rays winding over the annual rings like snakes. Ray cells relatively short, sometimes widening like barrels, their tangential walls mostly obliquely inclined to the radial walls. Horizontal walls smooth. Parenchyma cells not present in every annual ring. But they are sufficiently frequent in some annual rings, and they form a more or less coherent terminal parenchyma-chain. Horizontal wall of parenchyma cells usually smooth. 5000 tracheids belonging to 1 mm².

T. 4. Rays 1—9 cells high, usually 3—4 cells high, but also solitary rays are frequent. *Peirce* reports 1—24 cells high rays in his paper about the *Systematic anatomy of the woods of the Cupressaceae.* I could only detect 10 cells high rays in my sections. Cross-section of ray cells square, oblong or elliptic, while the marginal cells are more triangular. Ray cells 25—35 μ high and 10—15 μ wide. Among some of the larger ray cells there are also smaller ones, i. e. some rays are composed of cells of variable size. Their tangential walls are smooth, sporadically with primary pit-fields. Warts scattered or alined along the radial walsl or arranged horizontally, in which case a net-like drawing appears on the tangential wall. I could not find any pitting on the extremely thin radial wall. Parenchyma were rather frequent in some places, relatively elongated, with smooth or slightly warty horizontal walls. There are tiny pits on the tangential wall, which sometimes crowd in smaller or larger fields, or are sometimes alined in two rows along the radial walls. Pits on the tangential walls occur more in late wood. Tracheid-walls smooth. Bordered pits are more in the late tracheids present. Their borders are relatively small (7—8 μ), only about ⅓ of the tracheid-width. The porus small and circular. Occasionally delicate tchickenings are perceivable on the walls of the late tracheids, which run in spiral line. These thickenings run in oblique direction of the somewhat elongated porus of the bordered pits. 105—110 rays and 210—220 cells belonging to 1 mm².

R. 3. I could only find parenchyma cells in the rays, but not a single tracheid. Their horizontal walls were thin and smooth, without marked pitting, only with occasional protruding tiny warts, thus they were somewhat uneven. The tangential wall is also quite smooth, with a few very small nodular thickenings. No indentures at the contact of the horizontal and radial walls. Some of the tangential walls are somewhat curved, the curves swelling towards the cambium. The radial wall is also entirely smooth, or exceptionally delicately pitted. The pits in the cross-field are really the pits of the underlying tracheids and their apertures. There are pits in twos one above the other in each cross-field, and in the marginal cells 3—4 above each other, or even 6—8 pits, in the latter case arranged in pairs, while in the inner fields the 3 or 4 pits are mostly situated in the corners. Parenchyma cells rather frequent. Their horizontal walls are quite smooth, with tiny circular or longitudinal elliptic pits on their tangential or radial walls. Striation sometimes visible on the walls of the late tracheids.

ARAUCARIACEAE

11. **Agathis australis** Salisbury.

Plate 11.

Native of New Zealand. Test-material by courtesy of Division of Forest Products, Melbourne, Australia.

C. 1., 2. Annual rings rather thick. Some may be 3—4 mm wide, or even wider. Boundary of annual rings slightly undulated, but not marked. This markedness is caused by the fact that the walls of the late tracheids is much thicker (5—6 μ) than that of the early tracheids (3 μ). Also the size is varying. Tangential size of the late tracheids is 30—45 μ, and in radial direction 20—22 μ, These sizes of the early tracheids may be 35—40×50—60 μ, or even larger. All the tracheids are rounded, but more sexagonally shaped, and they form radial rows; some of the tracheid rows may be followed up over several annual rings. The tracheids beside the rays are sometimes somewhat larger than the inner ones, but sometimes the interior ones are larger than the tracheids close to the rays. Rays running in radial direction in a width of 2—15 tracheids. Their horizontal walls are quite smooth or with primary pitting. The radial and tangential walls appear also smooth. The ray cells contain a dark-coloured resinous substance. I could not discover parenchyma cells. — About 700—800 tracheids belonging to 1 mm^2.

T. 4. Tangential wall of tracheids smooth. But by very strong magnifying an obliquely running striation is visible which at some places has the appearance of primitive spiral thickenings, but this is only a surmise. Araucaroid pitting is visible in some late tracheids. This pitting may be in one or two rows and then the borders of the pits are regular sexagons and alternating. Aperture circular or somewhat elongated elliptic which may cross each other with the lower ones. Rays 2—20 cells high, but mainly 8—10 cells high. Cross-section of the ray cells square, vertical or horizontal oblong, while the marginal cells are more coniform. The rays are 20—35 μ high and 18—22 μ wide. Their horizontal and radial walls are completely smooth. No pitting is visible on the tangential walls either. All their walls are extremely thin, about 1 μ. I could not detect any wood parenchyma on this section either. About 30 rays and about 180—190 ray cells belonging to 1 mm^2.

R. 3. Radial wall of tracheids quite smooth, though the aforementioned striation is also visible in some late tracheids, and on this side the commencement of the spiral thickening is still more probable. Some of the tracheids may be even 70—80 μ wide. The bordered pits, particularly at the ends of the tracheids, may be in 2—3—4 rows on their walls. The borders of the pits — similarly to the bee-cells — are sexagonally dilapidated, but sometimes the pits are in solitary rows or parallel running. The wall of some tracheids shows singularly decorated bordered pits (see picture). Each sexangular pit is wreath-like surrounded by beads which lend them a peculiar shape and decoration. I was unable to observe such a pitting in the wood of any fir genus. The aperture of the pits is oblique obtuse elliptic, and they may cross each other with the underlying ones. The tracheids contain remarkably many trabeculae which are sometimes thin and sometimes thick. They are sometimes alined over a complete annual ring one beside the other. They are sometimes present also in the rays. The rays consist only of parenchyma cells. Their three walls are extremely thin and unpitted. There may be 3—6—10, or even 12 simple pits in a cross-field. These pits are really situated on the walls of the tracheids and they are only translucent through the thin ray walls. The pits are completely isolated because the rims of the borders do not touch each other, which means they are not hexagonal, but more oval. The resinous substance in the ray cells is here also well visible. There is sometimes primary pitting present on the horizontal walls.

TAXACEAE

12. **Austrotaxus spicata** Compt.*

Plate 12.

Native of New Caledonia. Test-material by courtesy of French Governor, Numea.

C. 1., 2. The annual rings vary in thickness, they may be 20—30, or even 60—70 tracheids broad. Boundary of annual rings indistinct because the walls of the late and early tracheids are nearly identical in thickness (3½—4 μ). Cross sections of the tracheids rounded, circular or multangular and their size is also varying. The rows of tracheids running beside the rays are sometimes broader than the others. The largest tracheids are 35—40 μ broad, while their radial diameter is 25—30 μ. Some late tracheids are quite small-lumened (5—6 μ). Sporadically thinwalled parenchyma cells occur among the tracheids, and also sporadically are visible pits on their horizontal walls. Rays run in radial direction 3—15—20 tracheids wide. Pitting is absent on their horizontal walls. Neither is pitting visible on their radial walls, or on their tangential walls. The parenchyma cells sometimes contain a resinous substance. 2800—2900 tracheids belonging to 1 mm².

T. 4. Though the walls of the tracheids in the tangential section are smooth, nevertheless occasionally an oblique striation is

* *Austrotaxus* is included by *Wieiliard* to *Podocarpus* on acconnt of its anatomical structure.

visible. Rays 1—6 cells high, but commonly 1—3 cells high. Cross section of the ray cells more vertical elliptic, size 30—34μ, width 12—15μ. The solitary rays may even be larger. Net-like primary pitting perceptible on the tangential walls of the ray cells. The horizontal wall is entirely smooth and appears to be of the same thickness as the radial wall. No pitting is perceptible on the radial wall either. The parenchyma cells are not infrequent among the tracheids. They may be 30—35 μ wide. Their horizontal walls are smooth, sparse circular pits may occur on their tangential walls. A few scattered bordered pits are present on the tangential walls of the tracheids, diameter 10—12 μ. Slit 3×6 μ, not extending to the rim of the border. Beside these somewhat larger bordered pits there are also smaller ones, with a diameter of 6—7μ. About 70—80 rays and about 100—110 ray cells belonging to 1 mm^2.

R. 3. Walls of the tracheids commonly smooth. On the walls of some late tracheids thickenings are perceptible, which are similar to spiral thickenings, and which run parallel to the oblique slits of the bordered pits. These thickenings appear to be some primitive streaky thickenings. Sometimes, however, they are horizontally arranged and run in intervals of 25—30 μ. In other tracheids, however, such streaks are lacking. The bordered pits are scattered, but sometimes, particularly at the ends of the tracheids, they are more frequent, they may be even so densely arranged that they almost contact. Size 10—12μ. They are circular or slightly flattened elliptic. The aperture towards the lumen is slit-like and the outer one circular. The slit sometimes reaches the rim of the border, but sometimes extends over it. Size of the aperture 6—8×3 μ. Some tracheids have also pit-pairs. The walls of the rays are thin, without any marked pitting. The tangential wall joins the horizontal wall in a slightly oblique direction, and there is no indenture at the place of contact. There is no pitting present on the tangential walls, at the most the warts of the primary pits are visible. 1—3 pits are present in a cross-field and 2—3 in a marginal cell, but these are not on the walls of the parenchyma cells, but the pits of the sublying tracheids are translucent. Apertures 6—8×3μ, while the borders of the corresponding bordered pits 8—10μ. Aperture oblique elliptic. All the walls of the longitudinal parenchyma are extremely thin, entirely smooth, without any thickening even on the horizontal walls. The borders and slits of the smaller pits which occur on the walls of the sublying tracheids, are translucent. Width of the parenchyma cells 15—18μ. Occosionally there may be a dark resinous substance in the wood parenchyma.

PODOCARPACEAE

13 **Acmopyle Pancheri** Pilger.

Plate 13.

Native of New Caledonia. Test-material by courtesy of the French Governor in Numea.

C. 1., 2. The annual rings vary in width. They may be 6—8, but also 40—50 tracheids wide. The boundary of the annual ring is sufficiently distinct which is caused in the first line by the difference between some rows of the thickwalled late tracheids and the thinwalled and wide-lumened early tracheids. Size of the early tracheids in radial direction is 26—30 μ and of the late tracheids only 9 μ. The walls of the late tracheids are 6 μ and of the early ones $1\frac{1}{2}$—2 μ broad. In tangential direction the tracheid rows are 22—24 μ broad. Their cross-section is rounded, that of the early tracheids more square, or — in radial direction — elongated oblong, while that of the late tracheids is — in radial direction — more flattened oblong. The tracheids may be multangular inside the annual ring. Scattered parenchyma cells may be perceived among the tracheids which contain a dark reddish substance. The parenchyma cells are chiefly situated among the late tracheids, sometimes quite close to the boundary of the annual ring. The rays run in radial direction, and their horizontal walls are mostly smooth, or with primary pitting. They run in various distances, sometimes in a width of 2—3, sometimes of 15—20 tracheids. Sometimes tracheid rows are perceptible in the annual rings which deviate in size from the others, and which may be followed through several annual rings. Some 2500 tracheids belonging to 1 mm^2.

T. 4. Walls of tracheids smooth, though in a larger or lesser distance spiral streaks are perceivable in some late tracheids, which, indeed, may not be termed as marked spiral thickenings. Bordered pits relatively large. Diameter 16—18 μ and they touch the walls of the tracheids. Their apertures are elongated elliptic 6×4 μ, but sometimes longer. But they never extend to the rim of the border. The aperture in the late wood is mostly vertical, but it may also extend over the border here. The bordered pits are relatively densely alined one after the other and their size is 10—11 μ. The rays are 1—6 cells high, but mostly 1—2 cells high. The cells are usually 20—28 μ high and 10—12 μ wide. Their tangential walls are smooth with primary pitting, but sometimes even Juniperoid pitting is present. The radial wall is smooth or with primary pitting. Quite many parenchyma are present, containing a reddish resinous substance. The horizontal walls are smooth; simple pits on the radial walls are quite frequent, but more unfrequent on the tangential walls. About 90—100 rays and about 160—180 ray cells belonging to 1 mm^2.

R. 3. Radial walls of the tracheids generally smooth, but traces of spiral thickenings are on this side also well perceptible. There are scattered bordered pits on the walls of the early tracheids, but sometimes they increase in density, in which case some borders touch each other araucarioid-like by a horizantal line. The horizontal walls of the rays are smooth, at the most a few simple pits are perceptible in them. The tangential wall is completely smooth, slightly curved, and there is no indenture at the contact with the horizontal wall. There is mostly only a single circular or elliptic pit in the crossfields and the two diameters of the pits are 14—15 μ and 9—10 μ respectively. Size of the pits in the late tracheids 9 and 6 μ resp. These pits are, however, not in the rays, but on the walls of the underlying tracheids and they are only translucent through the quite thin walls of the parenchyma. Where the ray parenchyma contacts the longitudinal parenchyma, there is sometimes pitting in the cross-field. Longitudinal parenchyma are not infrequent, the horizontal walls are completely smooth, and there are simple pits with a diameter of 6—7 μ on the radial walls, which follow each other in unequal distances. The tangential and the horizontal walls are, however, smooth. The pitting of the rays reminds on the whole of the *Podocarpus*.

14. **Dacrydium Franklini,** Hook. fil.

Plate 14.

Native of Tasmania. Test-material by courtesy of Division of Forest Products, South Melbourne.

C. 1., 2. Annual rings more or less uniform thick. Boundary of annual ring sometimes rather undulating. Wall of early tracheids thin, of the late tracheids gradually thickening. Mean size of late tracheids 10×25 μ, and that of the early tracheids 25×36 μ. Late wood may be 8—10 seriate, wall of tracheids here more rounded or flat oblong, while the tracheids of the early wood are more square and angular. Boundary of annual ring is consequently sharp enough. Ray cells running in radial direction and in varying intervals. Two rays running parallel sometimes 2—3, sometimes 8—10 tracheids wide. Thus the width of the rays is not quite uniform,because they sometimes become somewhat wider in radial direction. Despite of strongest magnifying pits could not be detected on their horizontal walls, only extremely small primary pit-fields. Neither were any pits perceivable on the horizontal walls of the sparse wood parenchyma cells. 2100 tracheids belonging to 1 mm^2.

T. 4. Rays in tangential section 1—13 cells high, but for the most part 4—6 cells high. *Hollendonner* records with reference to *Burgerstein* that *D. Franklini* may have 30 cells high rays. I was unable to find such high rays — despite of most careful investigation — in my test-material. Ray cells 22—26 μ high and 10—12 μ wide. Walls of tracheids smooth. Bordered pits absent on the walls of the early tracheids, but they are rather frequent in the late tracheids. Their borders are relatively small as compared with the width of the tracheids, having a diameter of 13—15 μ. Some of the pits extend over the border, but in most cases the slit-like outer apertures almost touch the pit-margin. The opposite slits mostly cross each other. Exceptionally two pits in one tracheid width. Oblique striations perceptible on the tangential walls of the tracheids, particularly on the walls of the late tracheids. Cross-section of rather numerous bordered pits present on radial walls.

Only scanty wood parenchyma, limited to the late wood.Parenchyma walls very thin and pits could not be detected despite of strongest magnifying. Horizontal walls also quite smooth and very thin. Width 22—24 μ.

Tangential walls of rays entirely smooth, at the most with very fine, primary thickenings. 50 rays and 195 ray cells belonging to 1 mm^2.

R. 3. Marginal cells of rays sometimes undulated, sometimes quite smooth. Their horizontal and tangential walls are also entirely smooth and extremely thin, somewhat warty, but without any thickenings or pitting. Through the thin ray-walls of the rays the large oval pits of the underlying tracheids well translucent. Pits in cross-fields either solitary or very seldom in pairs. Pits almost spreading over the entire cross-field, or the pit visible in a cross-field is much smaller than the other ones. Shape of pits almost reminds us of the large pits of *Pinus silvestris* and of *Sciadopytis.* Shape of pits in early wood either procumbent elliptic or rombus-romboid, while in late wood more vertical, on both ends tapering ellipse or oval. Size in early wood 13×25 μ, in late wood 6×12 μ. Undulating wall of marginal cells quite smooth, without any protrusion, or warts. Bordered pits irregularly arranged on radial walls of tracheids, sometimes contacting in pairs, sometimes arranged irregularly and in varying intervals. Borders of pits slightly flattened elliptic, thus not circular. Size 16—18 μ. Aperture usually circular or oval, sometimes, however, extending over the border. Slits crosswise in some of the pits extending over the border. Sometimes radially arranged fine dots, drawings perceivable in the pit borders by strong magnifying, which sometimes reminds of *Larix* (Look at drawing). Wood parenchyma only exceptionally present in radial section.

15. **Microcachrys tetragona** Hooker fil.

Plate 15.

Native of Tasmania. Test-material by courtesy of Division of Forest Products, Melbourne.

C. 1., 2. Annual rings relatively narrow (0.3—1 mm). Some 6—8, others 25—30 tracheids wide. Boundary of annual ring fairly prominent, early tracheids considerably larger than the late ones, which are strongly flattened along the boundary of the annual ring, and also their walls are decidedly thicker. Cross-sections of tracheids usually square or multangular, but very often irregularly shaped. Length of early tracheids in radial direction 30—40 μ, and of the late ones 10—15 μ, tangential width of both 16—20 μ. Shape of tracheids in a single row variable, sometimes small, sometimes larger, sometimes irregular. Rays running relatively far from each other, but sometimes only in a width of 1—2 tracheids. Horizontal walls of rays appear smooth, at the most with primary thickenings and occasionally filled with dark coloured resin. Only sparse parenchyma cells, usually along the rays. Some of these also with darker coloured contents. Their horizontal walls appear quite smooth 3000—3100 tracheids belonging to 1 mm^2.

T. 4. Rays usually 5—6, exceptionally 12 cells high, but there are also quite many 1—2 cells high. Cross-section of ray cells circular or elliptic, the marginal cells somewhat elongated, or wider. Height of rays usually 14—20 μ, width 6—8 μ. Their horizontal walls were thin, pitting not visible. Only very sparse parenchyma cells were perceivable in the examined tangential section.

Walls of tracheids smooth. On the tangential walls of early tracheids pits absent, but on the walls of the late tracheids the pits were closely alined. Borders relatively small (6—8 μ), about half of the tracheid width, or somewhat larger. Aperture circular or somewhat elongated elliptic, but sometimes also extending over the border, in which case the aperture extends over the rim of the border. The similar apertures of the pits, arranged on the yonder side of the tracheids, cross each other. 100—110 rays and 300—310 ray cells belonging to 1 mm².

R. 3. Walls of tracheids smooth. Bordered pits on their radial walls relatively densely alined; exceptionally 2 bordered pits may be found in a single tracheid width, in which case the contact line is mostly vertical or horizontal. The border of the pits is not a regular circle or ellipse, but irregular, sometimes ovoid or distorted, so that it exhibits a great variety. They are relatively small and never obtain the width of the tracheids. Diameter 12—14 μ.

There are only parenchyma cells in the rays. Their walls are very thin, without any pitting. The tangential walls are also quite smooth, quite exceptionally with 1—2 nodular thickenings. There are 2—3 large. *Pinus cembra*-like pits in the cross-field of the early wood, while the cross-field of the late wood contains mostly only a single large circular or vertically elliptic pit. This pit is actually on the tracheid wall, but it is translucent through the thin wall of the rays. There may be 3—4 pits in some of the cross-fields, and then these 4 pits are situated within the outlines of a larger oval pit. I could observe only a few parenchyma cells in this section. But it is not impossible that these were not genuine, but traumatic parenchyma cells. Since, however, such ovoid pits were present on the radial wall of some tracheids, which correspond to the simple pits of these cells, there cannot be much doubt that they are genuine parenchyma cells after all. Trabeculae were present in some of the tracheids, which continued in the same height over 2—3 annual rings. The parenchyma cells were relatively short and their horizontal walls quite smooth.

16. **Phaerosphaera Hookeriana** Archer.

Plate 16.

Native of Tasmania. Test-material by courtesy of Division of Forest Products, Melbourne, Australia.

C. 1., 2. Annual rings comparatively narrow. The narrower ones 15—20, the widest not more than 30 tracheids wide. Boundary of annual rings slightly undulating, but uniform. Sharp, made still more distinct by the flattened row of tracheids of the late wood, consisting of 5—6 cell rows. The flattened wall of the late tracheids is by no means thicker than that of the subsequent early tracheids, i. e. the strikingness of the boundary of the annual rings is caused rather by the flattened and dense tracheids. Size of the spring tracheids 14—16×16—18 μ, that of the late tracheids 16—18×6—8 μ. Transverse sections of tracheids procumbent oblong, square, eventually multangular. Interior part of the flattened tracheids along the boundary of the annual rings appears sometimes only as a thin slit. Sporadically also wood parenchyma cells in the annual rings. Distinct pitting absent on their horizontal walls, at the most 1—2 simple pits perceptible. Rays running in radial direction, occasionally considerably, almost barrel-like widening, densely running one beside the other. Sometimes 2—3, sometimes 7—8—10 rows of tracheids between them. Their tangential walls are not always running parallel to the boundary of the annual rings, sometimes elongated and obliquely inclined to the other radial wall (30—40°). The horizontal wall is mostly smooth, and in one length only sporadically 1—2 tiny pits perceptible. Elsewhere, indeed, the wall was quite smooth. 2—3 nodular thickenings were perceivable on the tangential walls of the rays, particularly they were obliquely inclined to the horizontal walls. 7600—7800 tracheids belonging to 1 mm².

T. 4. Rays 1—6, quite exceptionally 8—9 cells high. For the most part only 1—2 cells high. Cross-sections of ray cells more or less circular, but the marginal cells more ovoid. Mean size 12—14 μ, mean width 10—12 μ. Mostly 5—8 simple pits on tangential walls, usually alined near the radial walls; occasionally the pits are, however, elliptic, extending over the entire ray cells and showing a juniperoid scalariform pitting. Walls of the tracheids smooth, but oblique striations in the late tracheids. At the contact of the tracheids and ray cells 3—4, even 5 simple pits are possible in a ray cell height. Tracheid walls near the pits towards the cell-lumen slightly rounded. Rather pletiful parenchyma cells among the tracheids. Width 10—12 μ. Their horizontal walls mostly smooth or warty, elsewhere, however, nodularly thickened. Occasionally rather plentiful simple pits alined on the tangential walls, while considerably less on the radial walls. 250—260 rays and 470—480 ray cells belonging to 1 mm².

R. 3. Tracheid walls smooth. Bordered pits scattered, size 6—8 μ. Borders mostly procumbent ellipse with corresponding apertures, which are prominently horizontally situated and extending to the border rims. Parenchyma cells among them rather frequent. A good deal of circular or ellipsoid pits on the radial walls, either sparsely, situated, or in groups of 3—4. Tangential walls occasionally obliquely inclined, smooth or with 1—2 pits. There may be 5—6 simple pits in a cross-field at the contact-place of the parenchyma and the ray cells. Horizontal walls of the ray cells usually smooth, though in a greater or lesser distance simple pits are also possible. Tangential wall is either vertical to the horizontal wall, or inclined in acute angle to the opposite wall. Pits were found on horizontal walls too. 2—3 simple elliptic pits per cross-field. Simple pits on the radial walls conspicuous. Size 6—8×2—4 μ. Two mostly vertically alined simple pits per cross-field in the inner cells of the ray cells. They are short-elliptic in early wood, but rather vertical and slightly pointed in late wood. Spiral dense striation perceptible is some late tracheids.

17. **Phyllocladus trichomanoides** D. Don.

Plate 17.

Native of New Zealand. Test-material by courtesy of Prof. A. W. Jessep, Melbourne.

C. 1., 2. Boundary of annual ring rather striking; this strikingness emphasized by the larger lumen of the early tracheids and by the smaller lumen of the late tracheids. But there is hardly any difference in the thickness of the walls. The rows of tracheids arranged in succession over several annual rings. Transition gradually from early wood to late wood. Size of early tracheids 36—40×26—28 μ, that of the late tracheids 26—28×10—12 μ. Boundary of annual rings undulating, at some parts quite strikingly. Annual rings in general 40—60 tracheids broad. Rays running in radial direction and in varying distances. This distance is sometimes 4—5, sometimes 20—25 tracheids broad. No pitting visible on horizontal walls, at the most primary thickening. I could not discover parenchyma cells in the transverse section (see picture). 1450—1500 tracheids belonging to 1 mm².

T. 4. Rays uniseriate; I could not detect a single biseriate ray. Rays 2—18, quite exceptionally 20 cells high, but in general only 8—10 cells high. Wall of tracheids smooth, with sparse bordered pits on the tangential walls. Bordered pits extending over the border and the slit longitudinally tapered. Opposite pits mostly crossing each other. Obliquely inclined striation visible on the walls of some tracheids, particularly in the late tracheids. Ray cells more or less elongated elliptic, while the marginal cells are more triangular. Their walls are thin, no pitting could be discovered. Cells mainly 20—22 μ high, and 8—10—12 μ wide. Here I could not detect parenchyma cells. 50—55 rays and 260—270 ray cells belonging to 1 mm².

R. 3. Ray tracheids not present. Pits rather frequent on the radial walls of the tracheids. They are relatively small 10—12 μ and they never reach the 2 margins of the cells. They are seldom circular, mostly procumbent, slightly flattened elliptic. Pits extending over the border, apertures mostly extending well over the rim of the pits and this extension over the two pit-margins may constitute even a border-width. The apertures of the opposite pits mostly crossing each other. Rays composed of parenchyma cells, with very thin and entirely smooth walls. The tangential walls join the horizontal walls sometimes in a strongly acute angle and without indentures. Here neither was any pitting visible. Radial walls also quite smooth. One or quite sporadically two oval pits per cross-field. These are really tracheid-pits, translucent through the thin walls. The solitary pits usually spreading over the entire cross-field and are similar in this respect to the pits of the *Pinus silvestris* and the *Sciadopytis* or *Microcachrys* respectively. Size 20×16 μ. But here the border of the tracheid-pits is very large, while the aperture is obliquely inclined tapering ellipse. Pits in late cross-fields narrow and almost vertically arranged (6×20 μ). I could not detect wood parenchyma cells in the radial section either. Outer wall of the marginal cells of the rays also slightly undulating and entirely smooth. Also trabeculae present in some of the tracheids.

18 **Prumnopitys elegans** Philippi.

Plate 18.

Native of South America, somewhere in Chile. *(Podocarpus andinus.)* Test-material by courtesy of Prof. A. W. Jessep, Melbourne.

C. 1., 2. Boundary of annual ring quite indistinct, hardly visible. At the most the density and somewhat thicker walls of the late tracheids indicate the boundary of the annual ring. This boundary is usually even. Thickness of annual rings varying, sometimes 8—10, sometimes 25—50 cells wide. Size of tracheids divergent; size of early tracheids 32×20 μ, that of the late tracheids 20×12 μ. Beside the large tracheids also quite small tracheids present, sometimes irregularly arranged, or following each other regularly. An interesting phenomenon is that the cells of the tracheid rows running along the rays are at times somewhat larger and wider than the rows running in a grater distance from the rays. Rays running in varying intervals, mostly 6—8 tracheids wide. There are strikingly many parenchyma cells in the annual rings, which are arranged in some annual rings more in the late wood, sometimes 4—5 are adjacent or completely solitary, i. e. scattered. There is sometimes a great number of parenchyma cells present also in the early wood, sometimes, however, they are almost completely lacking in some annual rings. Very fine primary pit-fields are visible on the horizontal walls of the wood parenchyma cells and on the horizontal walls of the ray cells too. These extremely small warts are sometimes more numerous close by the radial wall, but in general they are scattered. 4300—4350 tracheids belonging to 1 mm^2.

T. 4. The wall of the tracheids is smooth in the tangential section, very sparsely pitted, only on the walls of the late tracheids may occur more pits. The pits are relatively small (6 μ), porus small, and the aperture never extends to the rim of the border. Rays usually 2—6 cells high, but mostly 2—3 cells high. Quite exceptionally the ray may be 10 cells high. Cross-section of ray cells elongated ellipse, height 16—18 μ, width 12—13 μ. Occasionally some solitary rays may be twice as high as the inner cells of the higher rays. Sometimes pitting is visible on their radial walls, while the tangential walls are generally smooth, or, quite seldom with a slight protrusion. Parenchyma cells are quite frequent, width 14—16 μ. Horizontal walls quite smooth, no pitting perceptible on the radial walls either. Sometimes small circular pits visible on the tangential walls, elsewhere the pits appearing as circles or oblique-ellipses. 215—220 rays and 490—500 cells belonging to 1 mm^2.

R. 3. The bordered pits on the radial walls of the tracheids are relatively densely arranged and sometimes they are closely alined. Aperture usually circular or slit-like, but in the late tracheids eventually extending over the border. In that event they cross each other with the underlying ones. Size 12—14 μ. Spiral thickening on their walls absent. Parenchyma cells quite frequent, width 9—10 μ, horizontal walls quite smooth, only sparsely visible a primary pitting on their tangential walls. Pits of tracheids translucent on the radial walls, consequently pits on the radial walls absent. This may be surmised by the phenomenon that the cross-fields at the contact of ray cells and of the parenchyma cells never contain pits. (See the lower right corner of the drawing.)

The rays are composed only of parenchyma cells. Their horizontal and tangential walls are entirely smooth and thin. The tangential walls join the horizontal walls under somewhat oblique angle. Indentures absent. Every cross-field contains mostly one relatively small elliptic pit, and in the solitary rays there are mostly 2 pits one above the other. Pits in the marginal cells of the higher rays are somewhat larger. The pits in the cross-fields are circular or somewhat inclined elliptic. Diameter of pits one-half or one-third of the cross-field. Size 6—8×10 μ. The pits in the cross-field of the late wood are elongated oblique ellipses.

19. **Amentotaxus argotaenia** Pilger.

Plate 19.

Native of West-China and Formosa. Test-material by courtesy of the Forstbotanisches Institut, Tarandt (Germany).

C. 1., 2. The annual ring is varying in thickness. Some are 40—50, some 70—80 tracheids wide. The boundary of the annual ring is not distinct because there is hardly any difference in the thickness of the late and early tracheids. Diameter of the last late tracheids in radial direction is 10—12 μ and in tangential direction 25—30 μ; on the other hand the early tracheids are 30—32 μ wide in tangential direction, while in radial direction they are of the same size or somewhat larger. The cross section picture of the tracheids in the annual ring is mostly rounded square or multangular. The late wood in the annual ring is usually much more extensive than the early wood. It is characteristic for the early wood that among the tracheids a remarkably large number of parenchyma cells is alined one beside the other. The parenchyma rows may also branch off and sometimes they show a quite peculiar design. This arrangement of the parenchyma cells is so characteristic that it allows by the cross section an immediate distinction from all the other conifers. Diameter of these parenchyma cells mey be 40—50 μ. 6—8 simple pits are visible on the horizontal walls of the parenchyma cells which are arranged regularly, or — almost sieve-like — irregularly. Rays usually uniseriate, quite exceptionally biseriate and they are running in radial direction. Simple pitting is sometimes quite well visible on their horizontal walls. The tangential wall is usually obliquely inclined to the radial wall. Rays sometimes 1, sometimes 20—25 tracheids wide. About 1900—2000 tracheids belonging to 1 mm².

T. 4. Spiral thickening present in the tracheids. Spiral lines always running in pairs under an angle of about 45°, but sometimes they are running horizontally in pairs or in threes. No bordered pits visible on the tangential walls, or only quite sporadically. Rays 1—10 cells high. I could not discover higher rays in the examined cross section. Cross section of the ray cells circular or slightly oval, height 20—26 μ, width 16—18 μ, the marginal cells or the solitary ray cells may be somewhat higher. Only primary pitting is visible on the tangential wall of the ray cells. But simple pitting is quite well conspicuous on their radial and horizontal walls. Parenchyma very abundant. The parenchyma cells may be 40—50 μ wide, their horizontal wall nodular and simple pits are well visible on the tangential wall. Where the parenchyma cells and the ray cells contact, simple pits are well visible on both which proves that simple pits are present on the radial wall of the ray cells.

About 60—65 rays and 160—170 ray cells belonging to 1 mm². Tangential wall of the parenchyma usually smooth, sporadically with circular simple pits.

R. 3. Pits on radial walls of the tracheids scattered and arranged in one row; I could discover pits in two rows only exceptionally and only on the walls of the early tracheids. Size of bordered pits 12—15 μ, aperture circular or slit-like, or extending over the border; the direction of the slit is identical with the direction of the spiral lines and very often the slit of the bordered pit is surrounded by two spirals. In some tracheids, where the two spirals are horizontal, they surround the bordered pits of the tracheids in the same manner as is visible in some species of *Callitris*.

The rays contain only parenchyma cells. Ray tracheids are imperceptible. The horizontal walls of the rays are smooth or primary pitted. The tangential wall is always smooth, unpitted. But there is simple circular pitting on the radial wall through which the aperture of the bordered pits of the sublying tracheids is well translucent. At the contact of the tangential and horizontal walls indentures quite distinct. Usually 2—3 pits in the cross-fields, but 4 pits may be present in some marginal cells or in solitary rays. If there are only 2 pits, they are usually diagonally arranged. Where the parenchyma contacts the ray parenchyma, in that cross-field there may be 3—10 simple pits of varying shape, size and arrangement. But if the tracheids end at the rays, there a simple pit is present in the ray parenchyma. Simple pits are in the tangential walls of the ray parenchyma. Remarkably plentiful parenchyma in the radial section. Several circular procumbent elliptic simple pits on their radial walls. The horizontal walls mostly with nodular thickenings, but sometimes smooth. The parenchyma cells may sometimes be 40—50 μ vide. Size of the simple pits of the rays 6—8 μ, and the slit is 3—4 μ wide. The aperture of the bordered pits of the tracheids is mostly inclined under 45°, i. e. diagonally, while the pits of the parenchyma are almost circular. The size of the latter is 6—8 μ.

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Die Wirkung der Beleuchtung auf den Zeitpunkt der Blütenbildung.[1]

Von DR. ISTVÁN SZALAI.

Einführung.

Bei den mit der Hirse angestellten Versuchen hat es sich herausgestellt, dass die Kurztagsbeleuchtung eine photoperiodische Nachwirkung besitzt, und zwar ist die Wirkung umso grösser, je eher die Keimpflanze ihr ausgesetzt wird. Auf ähnlicher Grundlage wurde auch der weisse Senf (*Sinapis alba* L.) untersucht. Aber das Verhalten der Langtagspflanzen ist nicht immer entgegengesetzt zu dem der Kurztagspflanzen, d. h. es ist — ceteris paribus — unmöglich, ihre photoperiodischen Erscheinungen einander wie ein Spiegelbild gegenüberzustellen. Bei der Hirse ist die Wahrnehmung der Reizwirkung unbefriedigend, solange die Pflanze noch unentwickelt ist und nur noch wenige Blätter trägt. Andererseites erklärten **Hamner** & **Bonner** (1939) auf Grund ihrer Beobachtungen an *Xanthium pennsylvanicum,* dass schon ein einziges Blatt der ständigen Langtagspflanzen für die Wahrnehmung der photoperiodischen Reizwirkung genüge. Ihrer Meinung nach ist es nicht die Dauer der Beleuchtung, welche den Zeitpunkt der Blütenknospenbildung bestimmt, sondern die Dauer der dunkeln Periode ist der entscheidende Faktor für das Erscheinen der Blüten. Sie sind der Ansicht, dass es sich hierbei um eine hormonalisch wirkende Substanz handelt, die vielleicht „Reservestoff" ist, weil selbst nach Entfernung der Blätter, welche für eine bestimmte Zeit einer Kurztagsinduktion ausgesetzt wurden, die Reaktion auch bei den Langtagsteilen zur Geltung kommt. Aber auch die Frage gelangt in den Vordergrund, ob die Pflanzen im Laufe ihrer Entwicklung einen Kurz- oder Langtagskarakter besitzen. Die Klärung dieses Problems ist vor allem in der Hinsicht wichtig, wie die Pflanzen sich in der reproduktiven Periode verhalten. **Eguchi** untersuchten im Jahre 1940 zahlreiche Pflanzen nach diesem Gesichstspunkte und stellte 9 Typen fest. Nach seinen Beobachtungen kann die gleiche Pflanze je nach ihrem Alter auf die Beleuchtung verschieden reagieren.

Um die Probleme studieren zu können, wurden in den Jahren 1947 und 1948 mit weissem Senf mehrere Untersuchungen angestellt,

[1] Eine Arbeit am Biologischen Institut der Szegediner Uniersität. Direktor: Prof. *Pál Greguss.*

in der Hoffnung, diese Probleme ihrer Lösung näherbringen zu können. Das Ergebnis dieser Untersuchungen ist wie folgt.

Experimenteller Teil.

Der weisse Senf ist zufolge seiner raschen Entwicklung für die Untersuchungen sehr geeignet. Dadurch, dass das Säen zu verschiedenen Zeitpunkten erfolgte und die Exemplare unter verschiedenen Vegetationsbedingugen wuchsen, wurde die Feststellug der allgemeingültigen Gesetzmässigkeit stark erleichtert. So konnten auch die Abweichungen in der Entwicklung in Betracht gezogen werden, die sich aus dem Unterschied der natürlichen Langtage und der künstlichen Kurztage ergaben.

Welche Wirkung übt die wechselnde Zahl der Langtagsbeleuchtungen auf die ältern Exemplare aus, welche vom Säen an kurztägig erzogen wurden?

Die zu untersuchenden Pflanzen wurden in 10 Gruppen eingeteilt. (Tabelle 1.)

Tabelle 1.

Gruppen	Anzahl der Versuchspflanzen	Anzahl der Tage bis zum Erscheinen der Blütenknospen insgesamt	hiervon LT	hiervon KT	Verkürzung der Vegetationsperiode im Verhältnis zu den KT-Exemplaren	Öffnen der Blütenknospe, gerechnet vom . . . Tage nach dem Säen
1	2	3	4	5	6	7
LT	20	17	17	—	37	24
I	16	49	2	47	5	62
II	17	40	4	36	14	52
III	15	39	6	33	15	51
IV	17	37	9	28	17	—
V	19	37	12	25	17	49
VI	15	37	15	22	17	47
VII	18	37	18	19	17	46
KT 10h	18	54	—	18	—	46
KT 8h	17	—	—	—	—	71

Bei den Langtagskontrollpflanzen erschienen die Blütenknospen am 17. und 18. Tage, und 7 Tage später öffneten sich die Blüten. Die Kurztagskontrollpflanzen, welche täglich einer zehnstündigen Beleuchtung ausgesetzt wurden, brachten nach 54 Tagen ihre Blütenknospen hervor und blühten am 71. Tage, während die Pflanzen, welche täglich nur achtstündig beleuchtet wurden, überhaupt nicht in den Zustand der Blütenknospenbildung gelangten. Die zehnstündigen Kurztagspflanzen wurden vom Zeitpunkt des Blühens der Langtagspflanzen, demnach am 17. Tage nach dem Säen für 2, 4, 6, 9, 12, 15 und 18 Tage der Einwirkung des natürlichen Langtages ausgesetzt. Die Ergebnisse sind in der Tabelle 1. enthalten.

Aus den Daten der Tabelle ergibt sich, dass es sich beim Senf um eine typische Langtagspflanze handelt, die dann am schnellsten blüht, wenn sie ständig einer Langtagsbeleuchtung ausgesetzt wird. Aus dem Umstand, dass die achtstündig Kurztagspflanzen nicht blühten, ja sogar nicht einmal Blütenknospen bildeten, lässt sich darauf folgern, dass es wohl der ungenügenden Entwicklung der vegetativen Teile zuzuschreiben sei, dass die reproduktive Phase sich nicht entwickeln konnte. Die Pflanzen blieben zwerghaft, ihre Blätter, besonders ihre Sprosse hatten eine bläuliche Färbung, und sie zweigten nicht ab. Die Pflanzen der Gruppen I—VII. wurden ausnahmslos am 17. Tage ihrer Entwicklung langtägig beleuchtet, und — wie es die Pflanzen der Gruppe IV. beweisen — üben 9 Langtage, falls die Pflanze ihr vorher ausgesetzt wird, die gleiche Wirkung aus, wie z. B. die 18 Langtage, welche der Gruppe VII. zu Teil wurden, aber nur hinsichtlich des Erscheinens der Blütenknospe, weil die Blüte sich im besten Falle erst nach 15 Langtagen öffnete. Die vierte, dritte, bezw. die siebente Kolumne der Tabelle beweisen, dass durch allmähliche Erhöhung der Anzahl der Langtage die Anzahl der für das Erscheinen der Blütenknospe erforderlichen Tage anfangs rasch vermindert wird, diese Wirkung aber später immer bedeutungsloser wird. In einer graphischen Kurve steigt die Kurve erst rasch, doch wird dieses Steigen dann immer geringer. (Zeichnung No. 2.)

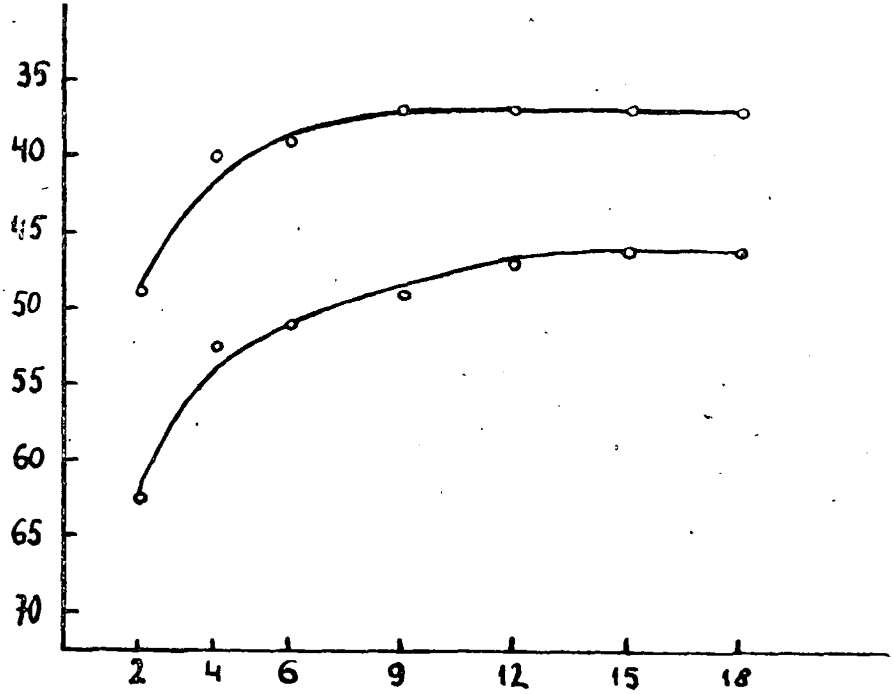

Abb. 2.

Auf der Ordinate ist die Anzahl der für das Erscheinen bezw. für das Öffnen der Blumenknospe notwendige Tage, auf der Abszisse die Anzahl der Langtage angegeben. Die obere Kurve bezeichnet das Erscheinen der Blütenknospe, die untere Kurve das Öffnen der Blüte.

Bei einer anderen Senfgruppe, mit einem Aussaattermin vom 2. Juni, wurde die Wirkung der Blattanzahl geprüft, d. h. *ob die Anzahl der Blätter auf den Zeitpunkt des Blühens überhaupt eine Wirkung besitzt, und gegebenenfalls wie gross diese sei.* Die Testpflanzen wurden in 5 Gruppen geteilt — jede Gruppe bestand aus je 6 Töpfen —, wobei in jeder Gruppe durchschnittlich 30—36 Pflanzen geprüft wurden. In Gruppe I. befanden sich die Langtagskontrollpflanzen, in der Gruppe II. die Kurztagskontrollpflanzen. In der Gruppe III. wurden drei Blätterpaare, in der Gruppe IV. zwei Blätterpaare, und in der Gruppe V. ein Blattpaar bei natürlicher Tanglänge gehalten. Die am 4. Juni erschienenen Keimpflänzchen wurden nach täglich zehnstündiger Beleuchtung in der Weise verdunkelt, dass die in die Erde gesenkten Töpfe mit je einem grösseren Blumentopf bedeckt wurden; sodann wurden, nachdem durchschnittlich drei Blätterpaare sich entwickelt hatten, im Sinne des Obengesagten, vom 18. Juni an je zwei, bezw. je ein Blätterpaar enfernt. Die Abweichung sowohl im Erscheinen der Blütenknospe, als im Öffnen der Blüte betrug in den Versuchsgruppen, und auch innerhalb der Gruppen zwischen den einzelnen Pflanzen, nur 1—2 Tage, und selbst diese war sehr unregelmässig, wie aus der nachfolgenden Tabelle ersichtlich ist. (Tabelle 3.)

Tabelle 3.

Gruppen	Anzahl der Blätter	Grösse der Pflanzen in Zentimeter	Durchschnittliche Anzahl der Tage bis zum Erscheinen der Blütenknospe		
			Insgesamt	hier von KT	hier von LT
1	2	3	4	5	18
I	8—9	25—32	18	18	—
II	12—14	8—10	49	—	49
III	6	14—17	33	17	16
IV	4	12—15	34	18	16
V	2	12—14	34	18	16

Falls die 14 Kurztage, die bis zur Beleuchtung verstrichen waren, von den Werten, welche in der vierten Kolumne der Gruppen III., IV. und V. erscheinen, in Abzug gebracht werden, zeigt es sich, dass der Senf schon mit einem Blattpaar „Florigen" herstellen kann, und in der Bildung der Blütenknospe nur 1—2 Tage hinter den Langtagskontrollpflanzen zurückbleibt.

Welche Rolle spielen im Endergebnis die Langtage? Diese Frage wurde bei neueren Senfgruppen untersucht, welche am 7. Juli 1947 ausgesät wurden. Die Keimpflänzchen jeder Gruppe wurden für 2, 4, 6, 8 und 10 Tage natürlicher Langtagsbeleuchtung ausgesetzt; sodann erhielten sie beständig eine täglich zehnstündige Beleuchtung. Der Vergleich des Zeitpunktes, an welchen die Blütenknospen in den einzelnen Gruppen, sowie an den Kontrollpflanzen erschienen, ist in der Tabelle 4. enthalten.

Tabelle 4.

Gruppen	Datum des Aussäens	Datum des Ausschlupfens	Beginn der Beleuchtung	Beleuchtungsverhältnis	Erscheinen der Blütenknospe	Erscheinen der ersten Blüten	Anzahl der Tage bis zum Erscheinen der Blütenknospe.
I	7, VII. 1948	10, VII. 1948	11, VII. 1948	Von Anfang an 2 LT	21, VII.	2, VIII.	14
II	„ „ „	„ „ „	„ „ „	„ „ „ 4 „	20, VII.	1, VIII.	13
III	„ „ „	„ „ „	„ „ „	„ „ „ 6 „	20, VII.	2, VIII.	13
IV	„ „ „	„ „ „	„ „ „	„ „ „ 8 „	19, VII.	30, VII.	12
V	„ „ „	„ „ „	„ „ „	„ „ „ 10 „	19, VII.	31, VII.	12
VI	„ „ „	„ „ „	„ „ „	„ „ dauernd LT	17, VII.	29, VII.	9
VII	„ „ „	„ „ „	„ „ „	„ „ „ KT	8, VIII.	—	32

Tabelle 5.

Gruppen	Datum des Aussäens	Datum des Ausschlupfens	Beginn der Beleuchtung	Beleuchtungsverhältnis	Ersheinen der Blütenknospe	Anzahl der Tage bis zum Erscheinen der Blütenknospe
I	7, VII. 1948	10, VII. 1948	11, VII. 1948	Von Anfang an 10 LT	19, VII.	12
II	„ „ „	„ „ „	„ „ „	vorher 2 KT, später 8 LT	23, VII.	16
III	„ „ „	„ „ „	„ „ „	„ 4 KT, „ 6 LT	26, VII.	19
IV	„ „ „	„ „ „	„ „ „	„ 6 KT, „ 4 LT	31, VII.	24
V	„ „ „	„ „ „	„ „ „	„ 8 KT, „ 2 LT	3, VIII.	27
VI	„ „ „	„ „ „	„ „ „	Dauernd LT (kontroll)	18, VII.	11
VII	„ „ „	„ „ „	„ „ „	Dauernd KT (kontroll)	7, VIII.	31

Um die Wirkung der Beleuchtung besser studieren zu können, wurde der Versuch auch umgekehrt durchgefürt, d. h. die Anzahl der Kurztage wurde vermindert. Das Resultat ist aus Tabelle 5. ersichtlich.

Durch Vergleich der Zahlen der beiden Tabellen kann auf mehrere Eigenschaften des Senfes gefolgert werden. Es ergibt sich, dass der Senf, als eine typische Langtagspflanze, Blütenknospen bei ständiger Langtagsbeleuchtung produziert. Falls die Anzahl der Langtage in jeder Gruppe um die gleiche Anzahl Tage vermindert wird, wird das Erscheinen der Blütenknospe gleichmässig gehemmt. Falls das Keimpflänzchen zu Beginn der Entwicklung Kurztage erhält, wird das Erscheinen der Blütenknospe wesentlich verlängert. Z. B. verursachen nach Einschaltung von nur zwei Kurztagen selbst acht Langtage keine so starke photoperiodische Nachwirkung, wie zwei Langtage ohne Einschaltung von Kurztagen. Aus diesen Daten dürfte hervorgehen, dass der Senf — im Gegensatz zur Hirse — (im Besitze seiner beiden Keimblätter und des ersten Laubblattpaares) gleich nach dem Ausschlüpfen am empfindlichsten ist und beim längern Wachsen immer weniger empfindlich wird. Um die gleiche Wirkung zu erzielen, muss die Anzahl der Langtage schon nach Einschaltung von wenigen Kurztagen wesentlich erhöht werden.

Da im Vergleich zu den Kurztagkontrollpflanzen die Exemplare, welche erst zwei Langtage erhielten, ihre Blütenknospen schon relativ früh entwickelten, wurde auch untersucht, *ob schon ein einziger Langtag hinreiche und wie gross der Einfluss der Keimblätter in der Auslösung dieser photoperiodischen Nachwirkung sei.* Die Pflanzen, welche am 16. August 1948 ausgesät wurden und nur einen einzigen Langtag der Beleuchtung ausgesetzt waren, entwickelten sich nicht gleichartig; sie brachten ihre Blütenknospen zu sehr verschiedenen Zeitpunkten hervor. Die weitere Prüfung dieser Frage musste wegen der rapiden Verkürzung der Tage auf die kommende Vegetationsperiode verschoben werden. Soviel konnte aber festgestellt werden, dass die gut entwickelten und lange Zeit bleibenden Keimblätter des Senfes *(cot. persistens)* in der Bildung von Florigen eine grosse Rolle spielen dürften, da die bis zum Erscheinen des ersten Laubblattpaares kurztägig behandelten, sodann um ihre Keimblätter gebrachten Exemplare auf die Langtagsbeleuchtung später reagierten, als die Kontrollpflanzen. Eine genauere Bestimmung der Resultate wird natürlich stark gehindert durch die obenerwähnte Erscheinung, dass der Senf in den ersten Tagen für die Langtagsbeleuchtung am empfindlichsten ist, während die Keimblätter von der Pflanze ohne Gefahr für ihre vegetative Entwicklung erst nach 5—6 tägiger Kurztagsbehandlung entfernt werden können.

Zufolge seiner raschen Entwicklung ist der Senf für Versuchszwecke besonders geeignet, obwohl infolge seiner Lichtbedürftigkeit seine Beobachtung im Laboratorium schwierig ist. Im Interesse des Fragenkomplexes der Entstehung und des Transportes des Blütenhormons musste auch die kritische Beleuchtungszeit entdeckt werden. Zwei Serien wurden eingesetzt. Eine davon im Freien im natürlichen Lebensraum, und die andere im Laboratorium bei ständiger künstlicher Beleuchtung. Die letztere war aus dem Grunde erforderlich, weil die natürlichen Lichtrelationen erheblich schwankten, und somit schon selbst halbstündige Beleuchtungsunterschiede die Auswertung unsicher machten.

Das Ergebnis der Laboratoriums-Untersuchungen ist aus der nachfolgenden Tabelle ersichtlich.

Tabelle 6.

Dauer der Beleuchtung in Stunden	Blütenknospe am ..... Tage	Anzahl der Blätter beim Erscheinen der Blütenknospe	Grösse der Pflanze in Zentimeter
18	13	6	14
17	14	6	13
16	14	6	12.5
15	16	5	12
14	17	5	11
13.5	18	6	14.5
13	18	5	14
12.5	20	6	13.5
12	23	9	22
11	30	10	25
10	58	12	23
9.5	67	10	18
9	89	9	18.5
8.5	—	10	18.5
8	—	9	18.5

Die Temperatur des Laboratoriums während der Versuche schwankte zwischen 24—29° C. Die Temperatur war am höchsten in den Abendstunden, als die Wärmeausstrahlung des ohnehin schon warmen Gebäudes durch die Lampen (ca. 1000 Watt) noch erhöht wurde. Die Beleuchtung der Versuchspflanzen wurde abends um 23 Uhr angefangen, und von 7 Uhr in der Früh angefangen wurden die einzelnen Gruppen in Schrankfächer gesetzt, welche in einen gut gelüfteten und verdunkelten Raum aufgestellt waren. Nach Beendigung der achtzehnstündigen Belechtung wurde von 17—23 Uhr gut gelüftet. Der Feuchtigkeitsgehalt wurde durch eine dünne Wasserschicht gesichert, die auf mit Blech überzogenem Fussboden des Laboratoriums gegossen wurde, und die Lufterneurung durch einen fortwährend tätigen Ventilator. Die Lichtstärke war 4000 Lux, abgesehen von den vor Mitternach auftretenden minimalen Schwankungen.

Der Vergleich der Ergebnisse der unter natürlichen Bedingungen erzogenen Senfpflänzchen (Tabelle 6.) mit den Laboratoriumsresultaten (Tabelle 7.) zeigt, dass die kritische Beleuchtung etwa 8—8.5 Stunden dauert.

Falls der Senf kürzere Zeit beleuchtet wird, wird er sich ständig vegetativ entwickeln. Falls er aber 8.5 Stunden oder länger beleuchtet wird, treibt er Blüten, selbstredend je nach Dauer der Beleuchtung früher oder später. Abweichend von der allgemeinen Regel, wonach

Tabelle 7.

Dauer der Beleuchtung	10^h	9.30	9^h	8.30	8^h
Erscheinen der Blütenknospe	6. August	9. August	12. August	18. August	am 8. Sept. noch nicht erschienen
Anzahl der Tage bis zum Erscheinen der Blütenknospe	30	33	36	42	—
Anzahl der Blätter beim Erscheinen der Blütenknospe	14	12	9	10	7
Pflanzenhöhe in Zentimeter	10—12	9—12	8—11	8—10	9—10

die Langtagspflanzen bei Kurztagsbeleuchtung sich nur vegetativ entwickeln — die Langtagsexemplare kräftiger —, bleiben die Kurztagsexemplare des Senfes stets zwerghaft *(fo. nana)*, sie treiben keine Zweige und sind an der unteren Blattseite, besonders an den basalen Teilen ihrer Sprosse bläulich gefärbt. Der Habitus hat sich derart geändert, dass die Stengelteile kurz blieben und das Blattwerk daher dichter wurde. Auch die Oberfläche der Blätter ist bei den Kurztagspflanzen kleiner, als bei den Langtagsexemplaren. (Zeichnung No. 8.) Dieser Unterschied ist aber

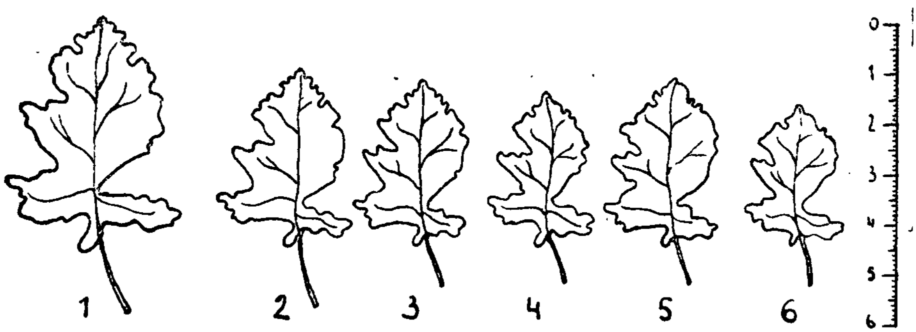

Abb. 8.

1. Blatt in natürlicher Grösse der Langtag-kontrollpflanze. 2. Blatt in natürlicher Grösse der zehnstündigen, 3. das der neunundhalbstündigen, 4. das der neunstündigen, 5. das der achtundhalbstündigen, 6. das der achtstündigen Kurztagspflanze.

bei weitem nicht so bedeutend, dass er bei der Entwicklung von Assimilatum störend wirken könnte. Hieraus dürfte aber folgen, dass bei dem Kurztagssenf die Bildung des Blütenhormons wahrscheinlich nicht durch den Mangel an Nahrung oder Reservematerial gehemmt wird, der sich in der langen Dunkelperiode assimileren würde, sondern durch die ungenügende Lichtmenge. Die Versuche müssen daher, besonders bei dem Senf, in dem Sinne fortgesetzt werden, ob die durch Blaufärbung hervorgerufene assimilierende Hemmung, oder unabhängig von der Assimilation, die Lichtmenge in der Auslösung der photoperiodischen Nachwirkung eine Rolle spielt.

Zusammenfassung der Ergebnisse.

1. *Der Senf ist eine typische Langtagspflanze.*
2. *Die Blütenbildung wird durch das Morgenlicht erhöht, durch das Nachmittagslicht gehemmt.*
3. *Die täglich nur achtstündig beleuchteten Exemplare entwickelten sich nur vegetativ, blieben aber in der Entwicklung hinter den Langtagsexemplaren zurück.*
4. *Die Langtage fördern die Blütenknospenbildung mehr, als das Öffnen der Blütenknospen.*
5. *Der Senf ist nur in der vegetativen Phase langtägig, in der reproduktiven Phase verhält er sich neutral zu der Beleuchtungsdauer.*
6. *Die Anzahl der Blätter spielt keine grosse Rolle, denn der Senf, wenn er zwei Keimblättchen und ein Paar Laubblätter besitzt, die gleiche Zeit für die Blütenknospenbildung benötigt, wie die langtägige Kontrollpflanze.*
7. *Je später die Pflanze der Langstagsbeleuchtung ausgesetzt wird, desio mehr Langtage benötigt er für die Erreichung des gleichen Wirkungsgrades.*
8. *Die Keimpflanzen sind am empfindlichsten gegenüber der Langtagsbeleuchtung, doch wird diese Empfindlichkeit mit dem Altern stets geringer.*
9. *Die Ende August und im Laufe des Septembers gesäten Pflanzen blieben alle zwerghaft, ähnlich wie die zehnstündigen Kurztagspflanzen, doch verhielten sie sich betreffs des Ersheinens der Blütenknospen beinahe ähnlich, wie die früher gesäten Pflanzen.*
10. *Der Senf als Langtagsflanze verhält sich immer umgekehrt zu der Kurztagshirse unter gleichen Bedingungen.*

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Szalai I.: Data on the Problem of Photoperiodism

Weiterhin: British Abstract, Bot. Centralblatt, Chem. Centralblatt.

Kárpát Ukraina vizeinek hydrobiologiai vizsgálata.
Gidrobiologicseszkie isszledsvanyija rek i ozjor v Zakarpatszkoj Ukrainye.
Hydrobiological investigation of the waters of Carpatho-Ukraine (U. S. S. R.).

(II. táblán 48 ábrával, 15 fényképpel és 1 térképmelléklettel.

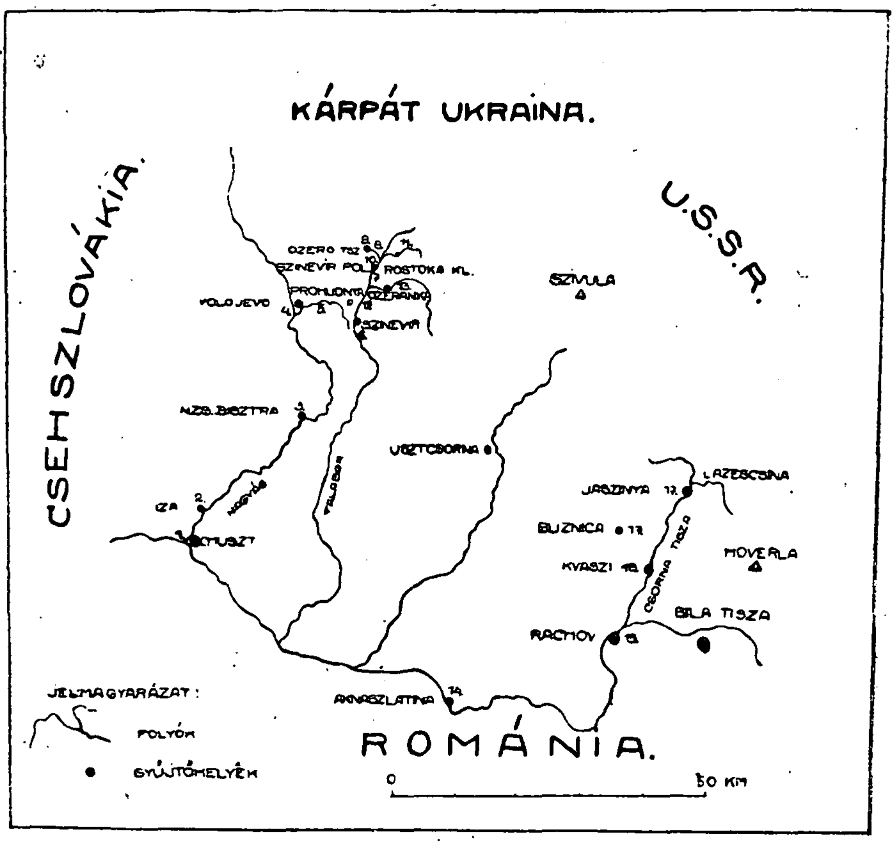
Irta: Dr. SZABADOS MARGIT (Szeged.)

Gyüjtőhelyek.

Kárpát Ukrainán 1940 június—július—augusztus hónapokban végzett hydrobiologiai-algologiai vizsgálataim során az alább felsorolt helyeken gyüjtöttem. Az egyes gyüjtőhelyeket a mellékelt térképen sorszámokkal jelöltem.

1. *Chuszt* (159 m t. sz. f. m.); *a)* a Tisza és *b)* árterülete pocsolyái, *c)* Nagyág, *d)* Husztica patak (VI. 26., VIII. 8.),
2. *Iza* (192 m t. sz. f. m.); útmelletti pocsolyák (VI. 26.),
3. *Nzs. Bisztra* (277 m t. sz. f. m.); Nagyág (VI. 22.),
4. *Volojevo* (425 m t. sz. f. m.); Nagyág (VI. 22., VIII. 9.),
5. *a)* Prohudnya patak (627 m t. sz. f. m.), *b)* útmelletti vízfolyások (VI. 22., VIII. 9.),
6. *Szinevir* (642 m t. sz. f. m.); Talabor (VI. 22., VIII. 9.),
7. *Szinevir Poljana* (800 m t. sz. f. m.) Talabor (VI. 24., VIII. 11.),
8. *Ozero tengerszem felé, patak* (989 m t. sz. f. m.), (VI. 24., VIII. 11.),
9. *Ozero tengerszem* (989 m t. sz. f. m.), (VI. 24., VIII. 11.),
10. *a) Rostoka patak* (896 m t. sz. f. m.); *b)* útmenti vízfolyások (VI. 24., VIII. 11.),

11. *Rostoka Klauze* (896 m t. sz. f. m.), (VI. 24., VIII. 11.),
12. a) *Ozeranka patak* (810 m t. sz. f. m.); *b)* útmenti vízfolyások (VI. 24., VIII. 11.),
13. *Ozeranka vízfogó* (810 m t. sz. f. m.), VI. 24., VIII. 11.),
14. *Aknaszlatina* (272 m t. sz. f. m; *a)* Tisza, *b)* sós tavak és nádasok (VII. 4.), VIII. 12.),
15. *Rachov* (474 m t. sz. f. m.) *a)* Tisza, *b)* borvizes patak (VII. 3., VIII. 13.)
16. *Kvaszi* (535 m. t. sz. f. m.) *a)* Csorna Tisza, *b)* borvizes patak (VI. 29.)
17. *Jaszinya* (550 m t. sz. f. m.) *a)* Csorna Tisza, *b)* Lazescsina, *c)* Bliznica hegység (1883 m) néhány forrása és patakja (VI. 30., VII. 1, 2.).



A gyüjtőhelyek limnologiai és hydrobiologiai viszonyai.

1. Chuszt; a) *Tisza.* A Tisza Chusztnál gyors folyású; jobb partja lapályos. Széles árterületen a kavicstörmelékkel feltöltött chuszti síkságon folyik keresztül. Jobb partja füzes-cserjés; itt ömlik belé a sok ágra szakadozott Nagyág. Bal partján emelkedik a Kabola (615 m) hegység (Tab. II. phot. 1.).

Vize a medréig átlátszó. Június 26-án kissé szeles, derült idő alkalmával (levegő hőmérséklete: 28° C; víz hőmérséklete: 23° C;

pH:7.5) a planktonozás eredményeként igen sok Bacillariat gyüjtöttem. A köveken *Stigeoclonium fastigiatum* és *flagelliferum* fajok alkottak bolyhos bevonatokat.

Augusztus 8-án az erős felmelegedés (levegő hőmérséklete 31° C) vizét 25° C-ra emelte (pH:7.5). A planktonban és a köveken a már említett fajokat ismét megtaláltam.

b) *Tisza árterülete pocsolyái.* Az 1939—40. évi magas vízállás idején a Tisza a chuszti síkságon messzire kiöntött, visszahúzódásakor azonban vizének egy része itt is, ott is visszamaradt egy-egy lapályos mélyedésben. Ezekben a tavaszi áradás alkalmával keletkezett apró tavacskákban, melyek széle füzes cserjékkel és *Phragmites communis* foltokkal szegélyezett, — június 26-án és augusztus 8-án élénken zöldelő, — fonalas algák okozta „vízvirágzás"-ra bukkantam.

Az erősen felmelegedett (29° C) vízben a partok mentén, a sekély vízben, csaknem a fenékig a több m²-nyi területen *Spirogyra sp. Zygnema sp.* és *Ulothrix sp.* vastag fonatai, szövedékei húzódtak meg. (Tab. II. phot. 5.). E kisebbfajta „vízvirágzásban" jelentékeny mennyiségben voltak a *Flagellata* fajokon kívül a *Cyanophyceae* és *Conjugatae.*

c) *Nagyág.* A sebes folyású Nagyág, mely a Keleti Beszkidekből ered, — Chusztnál széles völgyben kanyarogva siet a Tiszába. (Tab. II. phot. 3.) Vize smaragdzöld, a medréig átlátszó, tiszta és lepedékmentes. Június 6-án derült, meleg időben (délben a levegő hőmérséklete: 29° C); a víz hőmérséklete: 20° C; pH:8. A planktonpróbából *Cyanophyceae* és *Conjugatae* több faja került elő.

Augusztus 8-án (levegő hőmérséklete: 31° C, víz hőmérséklete: 22° C; pH:8) a part mentén a sekélyebb vízben igen szép számmal fonalas algákat *(Spirogyra sp. Ulothrix sp.)* is megfigyelhettem.

d) *Husztica.* A Husztica patak Chusztnál ömlik a Tiszába. Kőgátak közé szorított vize (Tab. II. phot. 2.) sok helyütt szennyes a belekerült szeméttől.

Június 26-i gyüjtés alkalmával meleg időben (víz hőmérséklete: 25° C; pH:8) végzett planktonpróba nem sok eredménnyel járt: sok növényi törmelék és egy sereg *Bacillariaceae* faj volt a vízben.

Augusztus 8-án ellenben a *Conjugatae* fajokat jelentős számban gyüjthettem. (Víz hőmérséklete: 21° C; pH:8.)

2. Iza; a) *Nagyág.* A Nagyág széles völgyében, Chuszthoz közel fekszik Iza. A folyó itt a község alatt kavicsos törmelékhátak között, sok ágra szakadozva folyik. Jobb partján hegyek húzódnak, bal partja füzes-cserjés. Itt épült a község is sajátos magastetejű házaival.

A folyó vize tiszta, a medréig átlátszó. Hőmérséklete (június 26-án): 15° C, a levegő hőmérséklete: 25° C; pH:7.5.

A planktonpróbából kevés *Cholorophyceae, Cyanophyceae* és *Conjugatae* faj került elő.

b) *Útszéli pocsolya.* A Chuszttól kiinduló és a Nagyág mentén felfelé haladó országúton *Cyanophyceae* okozta kisebbfajta „vízvirágzás"-t figyeltem meg. Az egynemű fűzöld színű víz felszínét kékeszöld, bőrszerű lepedék borította. Benne igen sok *Euglena* és *Closterium* fajt találtam.

3. Nzs. Bisztra; Nagyág. Chuszttól Horincsovóig a folyó széles völgyben terpeszkedik; számos mellékága van. Keletről és nyugatról több kisebb patakot vesz fel, melyek közül említésre méltó az Osava és Csehovec. Herincsétől kezdve a völgy összeszűkül. Nzs. Bisztránál ömlik a Nagyágba a Bisztra patak. A község a Borcsarszki hegység lábánál fekszik.

A folyó itt már rendkívül erős esésű, gyors folyású; partja meredek, kavicsos; lenn a szűk meredek völgyben sisteregve rohan előre. (Tab. II. phot. 14.)

Vize igen hideg. Június 22-én (víz hőmérséklete: 11° C, levegő hőmérséklete: 20° C; pH:7.5) a planktonpróba eredménye néhány *Oscillatoria planktonica* egyede volt. A köveket *Stigeoclonium sp.* gyepek borítják.

4. **Volojevo**; *Nagyág*. A község erdőktől borított hegyek által övezett szép völgykatlanban fekszik. Délre emelkedik a Kuk (Polonina 1365 m). A községen keresztül vezet az út a Nagyág mentén Torunig.

A folyó itt már egyenesebb lefutású. Bal partja köves-kavicsos. Árterülete széles, füves, mogyorós cserjés vegetatióval. A hegység a folyó vizéig húzódik. A hideg (hőmérséklete: 12° C) és igen gyors folyású patak vize egészen a medréig tiszta, átlátszó: pH:7.5.

Június 22-én a planktonpróba a növényi törmeléken kívül csupán néhány *Bacillariaceae* fajt eredményezett.

Az ártéren bújkáló mellékágakban igen sok helyen fonalas alga *(Spirogyra sp.* és *Zygnema sp.)* tömegeket leltem.

5. a) **Prohudnya patak**. A Prohudnya patak a Szinevir-környéki hegyekből ered és Volojevónál ömlik a Nagyágba. Kanyargós völgye Volojevót köti össze Szinevirrel. A patak esése igen nagy: 836 m-ről 425 m-re esik. Volojevónál a folyása megcsendesedik és helyenként oldalágakra szakad. Egy ilyen mellékágban, kb. 6—8 m hosszúságban *Lemna minor* és fonalas alga okozta „vízvirágzás"-t észleltem (Tab. II. phot. 4.).

b) *Vízfolyás a Prohudnya patak völgyében*. Igen gyakran figyeltem meg azt, hogy a hegyekről lecsurgó forrásvíz az útmenti mélyedésekben összegyülve, — lefolyása nem lévén — felmelegszik és igen jó fejlődési lehetőséget biztosít számos egysejtű és fonalas alga számára. Az egyik ilyen vízfolyásban több méter hosszúságban, főleg *Zygnema sp.* okozta „vízvirágzás"-ra bukkantam, amelyben néhány *Flagellata*, — *Chlorophycea* és *Desmidiacea* faj is résztvett.

6. **Szinevir**; *Talabor*. Ott, ahol a Prohudnya patak völgye kiszélesedve beletorkollik a Talabor festői völgyébe, fekszik Szinevir. Minden oldalról lombos és fenyőerdő borította 1300—1700 m magas hegyek veszik körül. Közelében emelkedik a Negovec (1712 m).

A Talabor a Keleti Beszkidekből ered és kanyargós utakon, vad zátonyokon fut, tajtékzik keresztül. A községtől északra veszi fel az Ozeranka patakot.

A folyó igen gyors folyású. Vize tiszta és a medréig átlátszó. Mélysége kb. 0.5 m. (Tabl. II. phot. 7.)

Június 25-i gyüjtés alkalmával hőmérséklete: 19° C; pH:7.5.) a levegő hőmérséklete: 28° C). Augusztus 10-én a víz hőmérséklete: 18° C; pH:7.5.), a levegő hőmérséklete: 20° C).

Mindkét alkalommal a planktonban néhány *Bacillariaceae* és *Cyanophyceae* fajt leltem; a köveket *Ulothrix sp.* fonalai borítják.

7. **Szinevir Poljana**; *Talabor*. **Szinevirt elhagyva és a Talabor** festői völgyén felfelé haladva, fenyvesektől borított hegyektől körül-

véve csakhamar elérjük Szinevir Poljanat. Nyugatra a Kamionka-vonulat, keletre pedig a Popadja (1456 m) és Kancs (1585 m) tetői emelkednek.

A Talabor itt már alig két-három méter széles. Kisebb-nagyobb zátonyokon, sziklákon bukdácsol keresztül. Vize hideg; június 24-én 15° C volt (a levegő hőmérséklete 21° C); pH:7.5.

Augusztus 11-én a víz hőmérséklete: 19° C, levegő hőmérséklete: 21° C; pH: változatlan.

A planktonpróba egyik alkalommal sem vezetett eredményre. A kövekről *Ulothrix sp. Spipogyra sp.* és *Stigeoclonium flagelliferum* gyepeket gyüjtöttem.

8. **Ozero tengerszem felé**; *patak.* A Talabort felső folyásán kísérve, — az Ozero tengerszem felé vezető út mellett egy kis patak ömlik a folyóba. Még két másik patak is találkozik itt: a Krasny és a Szloboda; egyik északnyugat, másik északkelet felől kerüli meg a Gorgan hegységet.

A patak egy darabon vizenyős réten halad keresztül; partján *Myosotis alpestris, Trollius europeus, Orchis maculatus, Gymnadenia conopea, Lychnis flos cuculi* és *Polygala vulgaris* virágzottak. Feljebb a forrása felé, a hegyoldalban *Nephrodium austriacum* levelei közül *Campanula carpatica* égkék harangja kandikált ki.

A patak medrében, különösen a lassúbb folyású helyeken — igen sok fonalas algát (*Ulothrix sp.*) gyüjtöttem, melyek között egy-két színtelen *Flagellata* faj is volt.

9. **Ozero tengerszem.** A kb. háromszögalakú tó teljesen zárt völgykatlanban fekszik. Területe: kb. 360—400×250 m² (Tab. II. phot. 9, 10.). Nyugaton az Ozirnya (1500 m) csúcsai emelkednek. A hegység lába belenyúlik a tóba; a sötétzöld fenyők a víz széléig sorakoznak. Csak a keleti partja lankás; fenyővel vegyes lomberdővel borított. Kidőlt fatörzsek hevernek a parton, félig a vízbe nyúlva; kérgüket mossák a nyugati szél keltette hullámok. Hulladékuk ezen a helyen szennyessé teszik a vizet. Igen sok fadarabon a zöld színt *Protococcus viridis* okozta.

A tengerszem partján vízi növénynek, fonalas alga vagy mohának a nyomát sem leltem; lent a vízben a medret *Spongilla lacustris* telepek borították.

Vize zöldes színű; hideg. Június 24-én felhős, szeles időben (levegő hőmérséklete: 20° C) hőmérséklete: 9° C volt.. pH:7. Vize a parton a medréig átlátszó, tiszta, lepedékmentes. A plankton eredménye igen szegényes volt. Augusztus 11-én a víz hőmérséklete: 19° C; levegő hőmérséklete 25° C, pH; változatlan. A planktonpróba már az előbbinél jóval eredményesebbnek mutatkozott. Főként *Flagellatae, Cyanophyceae, Chlorophyceae* és *Conjugatae fajok alkották.*

10. *a)* **Rostoka patak.** A Rostoka patak az 1180 m magas Sztrunga hegységből ered és délnyugatra folyva ömlik a Talaborba. Az út a hegyek lábánál kígyózik végig. A völgy alján, mélyen a sziklák között csillog a Rostoka ezüst szalagja. Néhol kiszélesedik a völgy és a fenyőszegélyezte tetőn *Chrysanthemum leucanthemum* virágmezők fehérlenek.

A patak vize hideg; június 24-én: 9° C hőmérsékletű volt (levegő hőmérséklete: 22° C, pH:7.5.

A kövekről *Stigeoclonium flagelliferum* gyepeket gyüjtöttem.

11. **Rostoka Klauze.** A Rostoka patak vízduzzasztója kb. 896 m

t. sz. f. m.-ban van. 500 m hosszúságban duzzasztják fel a patak vizét. Ha a megfelelő mennyiségű víz összegyűlt, megnyitják a zsilipet és az időközben felsorakozó tutajokat hatalmas erővel viszi a Talaborba, illetve onnan a Tisza, az Alföld felé.

Június 24-én csendes volt a vízfogó környéke; néhány napja engedték le a tutajokat.

A vízfogónál mindkét part meredek; füves-cserjés. A víz mély; kb. 3—4 m mély (duzzasztáskor). Kb. 1 m mélységig átlátszó, zöldes színű. Hőmérséklete: 20° C; pH:7.5. Levegő hőmérséklete: 29° C.

Augusztus 11-én a víz duzzasztás előtt állt. Zöldes színű; a felületen sárgás-barna lepedék, amelyet *Bacillariaceae* fajok tömegei alkottak. A víz hőmérséklete: 16° C; levegő hőmérséklete: 22° C; pH:8.

12. a) *Ozeranka patak.* Az Ozeranka patak a Csorna Rika hegységből ered (1263 m) északnyugat, majd délnyugatnak tart. Völgye festői. Eleinte szűk, meredek sziklafalak emelkednek az út két oldalán. Lenn a völgyben, szinte megközelíthetetlen mélységben zúg, kavarog a víz, vadul száguld szikláról sziklára. A vízben lévő köveket *Stigeoclonium flagelliferum* gyepek fedik. 810 m magaslaton túl kitárul a völgy és gyönyörű virágos rét hullámzik előttünk. (*Chrysanthemum leucanthemum, Campanula macrostachya, Campanula putula, Orchis maculatus, Melandrium rubrum).*

b) *Vízfolyás a patak mentén.* Az útmelletti vízfolyásban több méter darabon kisebb-nagyobb megszakításokkal *Spirogyra sp.* okozta „vízvirágzás"-ban igen sok *Desmidiaceae* fajt leltem.

13. **Ozeranka vízfogó.** Az Ozeranka vízfogó egyike Karpat Ukraina legnagyobb vízfogóinak. A hatalmas hármas szárnyas zsilip elzárásakor kb. 1000 m hosszúságban és 250 m szélességben gyűlik itt meg a patak vize.

Június 24-én éppen megnyitották a zsilipet. A megdagadt víz hatalmas robajjal zúdult keresztül a zsilipek szárnyai alatt és egymásután repítette hátán a tutajokat, melyek percek alatt tüntek el szemeink előtt. Utána zavaros, szennyeszöld lett a víz. Hőmérséklete: 18° C; pH:7.5. (A levegő hőmérséklete: 27° C.)

A planktonpróba mikroscopicus vizsgálatából kitűnt, hogy a kékes színeződést *Cyanophyceae* fajok mérhetetlen tömege okozta.

Augusztus 11-én a víz tiszta, átlátszó volt; hőmérséklete 16° C; pH:7.5 (levegő hőmérséklete: 20° C).

Már nyomát sem találtam a *Cyanophyceae* okozta „vízvirágzás"-nak.

14. **Aknaszlatina;** a) *Tisza.* Aknaszlatinánál a Tisza széles árterületen ágazik szét a kavicsos földhátak között (Tab. II. phot. 15.). Vize — július 4-én — piszkos, szennyes; hőmérséklete: 21° C; pH:8.5 (levegő hőmérséklete: 29° C). A planktonpróba eredménye néhány *Bacillariaceae* faj volt.

A kövekről *Stigeoclonium sp.* gyepeket gyüjtöttem.

b) *Sóstavak.* A Chuszt felé vezető országúttól délre gyalogút visz le a régi, elhagyott sóbányához. A régi tárna környékén, a kavicsos földhátak között lévő kisebb-nagyobb mélyedésekben náddal és sással szegélyezett sós tavacskák szétszórtan helyezkednek el. Ezeket, az ottani lakosok számokkal jelölik meg. Az út baloldalán, közvetlenül a tárna mellett alig 5 m-nyi nagyságú mély gödörben a tiszta víz alól fonalas algák (*Spirogyra sp., Zygnema sp.*) zöldeltek. A víz hőmérséklete 24° C; pH:9.

A mellette lévő 18-as jelzésű tó békalencsével borított vizét, a partját szegélyező sástól alig lehetett megközelíteni. A merítésből vett próbából igen sok Flagellatae és Chlorophyceae került elő.

A közelében lévő 19-es tavacska a lakósok szerint önálló forrásból táplálkozik. Hőmérséklete: 23° C.

Az út jobb oldalán elterülő 15-ös jelzésű nagyobb tavat fürdésre is használják. Hőmérséklete 24° C. Mindegyik tó vizének pH-ja 9—.

A 19 és 15-ös jelzésű tavakban *Spirogyra sp.*-en kívül igen sok *a Cyanophyceae* és *Desmidiaceae* faj.

15. **Rachov;** a) *Tisza.* A községtől északra, ott, ahol a Bila és Csorna Tisza egyesülnek egymással — planktonpróbát vettem a vízből, melyben csak néhány *Bacillariaceae* faj volt. A víz hőmérséklete ez alkalommal (július 3-án) 15° C; pH:8.5 (levegő hőmérséklete: 25° C). (Tab. II. phot. 13.)

Augusztus 13-án a víz hőmérséklete: 29° C; pH:8.5 (levegő hőmérséklete: 29° C). A kövekről fonalas alga *(Oedogonium sp.)* gyepeket gyüjtöttem. A planktonpróba ez alkalommal sem vezetett eredményre.

b) *Borvizes patak.* A rachovi savanyú víz forrásnál lévő öreg malom deszkáiról és a patak köveiről fonalas alga *(Oedogonium sp.)* gyepeket szedtem.

16. **Kvaszi;** a) *Tisza.* A Tisza itt tiszta vizű, gyors folyású; egészen a medréig átlátszó. Hőmérséklete: 20° C; pH:7.5 (levegő hőmérséklete: 26° C). Június 29-én vett planktonpróba eredményeként néhány *Bacillariaceae* faj került elő a vízből.

b) *Borvizes patak.* Kvaszi vidékén „borkút" néven ismert jódossavanyú források igen kiváló gyógyhatásúak és a vizük kellemes, üdítő. (A néphit azt tartja, hogy rendszeres ivásuk meghosszabbítja az életet.)

A savanyú víz az utak mentén felgyülemkedik és erősen felmelegszik. Ezeken a helyeken igen sokszor fonalas alga okozta „vízvirágzás"-okat láttam, amelyekben a többek között néhány *Cyanophyceae* faj is volt.

17. **Jaszinya;** a) *Fekete Tisza.* A Csorna Tisza Jaszinyánál alig 3 méter széles; tiszta, átlátszó; igen gyors folyású. Hőmérséklete: június 30-án 18° C; pH:7.5. Levegő hőmérséklete: 23° C.

A planktonpróba nem vezetett eredményre; a kövekről *Ulothrix sp.* gyepeket gyüjtöttem.

b) *Lazescsina patak.* A Lazescsina patak a Hoverla északi lejtőjéből ered több kisebb-nagyobb ágból és észak felé fut Lazescsina nevű helységig; innen nyugat felé fordul és Jaszinyanál ömlik a Csorna Tiszába.

Július 1., 2-án végzett gyüjtések alkalmával a patak vize kissé szennyezett volt. Igen gyors folyású; hőmérséklete: 19° C; pH:8- (levegő hőmérséklete: 20° C.).

A vízben csupán fonalas algákat leltem.

c) *Bliznica hegység néhány forrása és patakja.* Jaszinyától dél felé igen hosszú párhuzamos gerincek tartanak a Tisza sigheti medencéje felé. A leghosszabb gerinc a hegység legmagasabb csúcsáról: a Bliznicáról (1883 m) indul ki s a Csorna Tiszát egészen a Visó torkolatáig kíséri.

Június 30-án kerestem fel a Bliznicát; még hófoltok is voltak rajta. Szép, tiszta időben nagyszerű kilátás nyílt róla a Sztich, távolabb pedig a Hoverla és Pietrosz hófödte csúcsaira.

A hegyoldalban ekkor virított a: *Campanula macrostachya* és *Campanula patula*, továbbá a *Trollius europeus, Myosotis campastris* és *Chrysanthemum leucanthemum.*

Igen sok erre a forrás, amelyek üdítő vizét ember, állat szívesen issza. Egyik forrás vályújáról igen sok *Cyanophyceae, Chlorophycaea* és *Desmidiaceae* fajokat gyüjtöttem.

A hegyoldalról lefutó patakok vize a lankásabb helyeken megpihen, medre kiszélesedik és a kissé felmelegedett vízben és a detritusban zöld színű lepedékbe tömörültek a fonalas algák *(Spirogyra sp., Zygnema sp.*, de főleg a *Conjugatae* fajok).

Rendszertani felsorolás.*

1. *Cyanophyceae.*

1. *Gomphosphaeria aponina Kütz* (Correx. Dr. Kol E.) *(Tab. I. fig. 1.)* Méret: 3—4 μ. Ozero tengerszem; plankton; sok. VIII. 11.

2. *Merismopedia tenuissima Lemm. (Tab. I. fig. 2.)* A colonia mérete: 20—25 μ. Egy sejt átmérője: 1—1.5 μ. Ozero tengerszem; VIII. 11.

3. *Anabaena circinalis Rabh.* A sejtek mérete: 6.5—7 μ. Aknaszlatina; VIII. 12.

4. *Anabaena constricta (Szafer) Geitler. (Tab. I. fig. 7.)* A trichoma heterocysta nélkül. A sejtek lekerekítettek. Méret: 5.6—7 $\mu \times$ 6—9 μ. Chuszt; Tisza ártér; VI. 26.—VIII. 8. — Husztica; VI. 26—VIII. 8. Prohudnya patak; vízfolyásban; VI. 22., VIII. 8. — Talabor Szinevir Poljanánál; VI. 24., VIII. 11. — Aknaszlatina; VIII. 12. — Jaszinya; Bliznica; forrás; VI. 30.

5. *Nostoc sphaericum Vauch.* Méret: 4.5—5 μ. Bliznica; forrás; sok, VI. 28.

6. *Oscillatoria Agardhii Gom. (Tab. I. fig. 9).* A trichoma egyenes, vagy elgörbült. Quadratikus. Méret: 3—4 μ. A végsejt gömbölyded, vagy elhegyesedő calyptrával. Ozero tengerszem; VIII. 11. — Ozerankai vízfogó; VI. 24. — Aknaszlatina; sóstavak; VIII. 12.

7. *Oscillatoria limnetica Lemm. (Tab. I. fig. 8.)* A trichoma egyenes, a sejtfalnál befűzött. 1—5 μ széles, 4—10 μ hoszú. Chuszt; Nagyság; VI. 26. VIII. 8 — Ozerankai vízfogó; VI. 24. — Ozeranka patak völgye, vízfolyás; VI. 24. — Kvaszi; borvizes patak, VI. 29. — Bliznica; patak; VI. 28.

8. *Oscillatoria neglecta Lemm.* Végsejt lekerekített. 1.3 $\times$ 2 μ méretű. Aknaszlatina; sóstavak; VIII. 12.

9. *Oscillatoria planktonica Wolosz. (Tab. I. fig. 10.)* Trichoma 1.5—1.8 μ széles, u. o. hosszú. Chuszt; Tisza ártér; VI. 26., VIII. 8. — Iza; pocsolya; VI. 26. Nagyság Nzs. Bisztranál; VI. 22. — Talabor Szinevir; VI. 22., VIII. 10. — Ozerankai vízfogó; VI. 24. — Bliznica; patak; VI. 28.

10. *Spirulina princeps W. et G. S. West.* Trichoma 4.5—5 μ széles. Aknaszlatina; sóstavak; VIII. 12.

* Dolgozatom kliséi a Kolozsvárott 1944-ben kiadásra készülő Folia Cryptogamica II. Vol. 6. numerusa részére készültek, azonban a füzet nem jelenhetett meg.

11. *Spirulina spirulinoides (Ghore) Geitler*. Trichoma átmérője: 1.8—3 μ. Aknaszlatina; sóstavak; VIII. 12.

12. *Lyngbia Lagerheimii (Möb.) Gom*. Méret: 2×3 μ. Iza; pocsolya; VI. 26. Prohudnya patak völgye; vízfolyásban; VI. 22.

13. *Lyngbia limnetica Lemm*. Trichoma egyenes. Méret: 1—2× 1—1.5 μ. Végsejt lekerekített. Iza; pocsolyában; VI. 26. — Ozero tengerszem; VI. 24. — Kvaszi; borvizes patak; VI. 29.

2. *Flagellatae*.

14. *Dinobryon cylindricum Imhof. (Tab. I. fig. 6.)* A capsula alul elvékonyodó, felül kiszélesedő. 40—45 μ×10—12 μ. Ozero tengerszem; VIII. 11.

15. *Dinobryon sertularia Ehrenb. (Tab. I. fig. 5)*. Méret: 30—35 μ ×9—10 μ. Laza, 6—7 sejtű coloniát képez. Ozero tengerszem; VIII. 11.

16. *Dinobryon stipitatum Stein. (Tab. I. fig. 12.)* A capsula hengeres, hosszan kihúzott, nyélszerű kúpban végződik. Méret: 37—39 ×8—9 μ. Ozero tengerszem; VIII. 11.

17. *Cryptomonas erosa Ehrbg. (Tab. I. fig. 18.)* Sejt ovalis. Méret: 15—18×8—9 μ. Aknaszlatina; sóstavak; VIII. 12.

18. *Euglena fusca (Klebs) Lemm*. Periplast barnás színű. Méret: 90—100×10—15 μ Aknaszlatina; sóstavak; VIII. 12.

a) *var. marchica Lemm*. A typusnál kisebb és szélesebb. Aknaszlatina; sóstavak; VIII. 12.

19. *Euglena granulata (Klebs) Lemm. (Tab. I. fig. 26)*. Méret: 60—69×10—14 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Husztica; VIII. 8.

20. *Euglena mutabilis Schmitz (Tab. I. fig. 24)*. Méret: 146—150×10—12 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Iza; pocsolya; VI. 26. — Prohudnya patak völgye; vízfolyás; VI. 22. VIII. 9.

21. *Euglena pisciformis Klebs (Tab. I. fig. 23)*. Méret: 7—8× 24—28 μ. Chuszt; Tisza ártér; VI. 26., VIII. 8.

22. *Euglena proxima Dang*. Metabolikus. Méret: 52—69×16 —20 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8.

23. *Euglena sanguinea Ehrbg. (Tab. I. fig. 27)*. Répa-, vagy orsóalakú. Méret: 48—62×12—27 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Aknaszlatina; sóstavak; VIII. 12.

24. *Euglena viridis Ehrbg. (Tab. I. fig. 29)*. Orsóalakú. Méret: 10—17 μ széles, 38—49 μ hosszú. Aknaszlatina; sóstavak; VIII. 12.

25. *Phacus caudatus Hübner (Tab. I. fig. 30)*. Sejt lapított. Méret: 40—77 μ×19—22 μ. Iza; pocsolya; VI. 26.

26. *Phacus costatus Conrad (Tab. I. fig. 31)*. Sejt korongalakú; végtüske rövid. Paramylum hiányzik. Méret: 13—17×20—25 μ. Kvaszi; borvizes patak; VIII. 29.

27. *Lepocinclis Steinii Lemm (Tab. I. fig. 19)*. 30—35×12—16 μ méretű. Jaszinya; Bliznica; patak; VIII. 30.

28. *Trachelomonas hispida Perty (Tab. I. fig. 25)*. Héj tüskékkel fedett. Méret: 19×21—26 μ. Aknaszlatina; sóstavak; VIII. 12.

29. *Trachelomonas planktonica Swirenko (Tab. I. fig. 28)*. Héj ellipticus; pontozott. Porus magas gallérral, széle fogazott. Méret: 10—12×25—30 μ. Aknaszlatina; sóstavak; VIII. 12.

30. *Trachelomonas volvocina Ehrenb. (Tab. I. fig. 32)*. Gömbölyű. Ostornyílás alacsony gyűrűvel. Méret: 7—15 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Aknaszlatina; sóstavak; VIII. 12.

31. *Trachelomonas Woycickii Koczwara.* Héj gömbölyded. Rövid tüskékkel sűrűn fedett. Méret: 18—20 μ. Aknaszlatina; sóstavak; VIII. 12.

32. *Astasia lagenula (Schew.) Lemm. (Tab. I. fig. 20).* Körtealakú. Méret: 9—10×24—25 μ. Ozero felé; patak; VI. 24. VIII. 11. — Rostoka patak völgye; vízfolyás; VI. 24.

33. *Peranema trichophorum (Ehrenb.) Stein (Tab. I. fig. 21).* Megnyúlt, alul lekerekített. Méret: 25—40×8—13 μ. Ozero fehé; patak; VI. 24. VIII. 11.

3. *Volvocales.*

34. *Chlamydomonas globosa Snow.* Gömbölyű. Papilla hiányzik. Méret: 6—8 μ. Rostoka patak völgye; vízfolyás; VI. 24.

35. *Chlamydomonas Westiana Pascher.* Eliptikus. Méret: 14—20×17—18 μ. Husztica; VIII. 8. — Rostoka patak völgye; vízfolyás; VI. 24.

36. *Sphenochloris urceolata Pascher (Tab. I. fig. 17).* Méret: 9×15—16 μ. Aknaszlatina; sóstavak. VIII. 12.

37. *Gonium pectorale Müller.* (correx. Dr. Kol E.) Kolonia 4 sejtű. Méret: 7—8×10—12 μ. Ozero tengerszem; VIII. 11.

38. *Pandorina morum (Müller) Bory.* Kolonia 16 sejtű. Átmérője: 48 μ. Ozero tengerszem; VIII. 11. Jaszinya; Bliznica; forrás; VI. 30.

39. *Eudorina elegans Ehrbg. (Tab. I. fig. 15).* Kolonia 16—32 sejtű. Sejtek mérete: 20—24 μ-ig. Jaszinya; Bliznica; forrás; VI. 30.

4. *Protococcales.*

40. *Pediastrum angulosum Raciborski.* Szélsejt lekerekített; papillával. Méret: 12—17×12—15 μ. Aknaszlatina; sóstavak; VIII. 12.

41. *Pediastrum bidentulum var. ornatum Nordstedt.* Coenobium köralakú. Szélsejtek két foggal ellátottak. Membrana granulumos. Méret: 15—18 μ. Aknaszlatina; sóstavak; VIII. 12.

42. *Pediastrum Boryanum (Kütz.) A. Braun.* Coenobium átmérője: 50—54 μ. Szélsejtek mélyen kivájtak. Ozero tengerszem; VIII. 11. — Aknaszlatina; sóstavak; VIII. 12. — *Var. granulatum.* Sejt granulumos. Ozero tengerszem; VIII. 11. — Aknaszlatina; sóstavak; VIII. 12.

43. *Pediastrum duplex Meyen.* Sejt méret: 8—16 μ. Ozero tengerszem; VIII. 11.

44. *Pediastrum Kawraiskyi Schmidl.* Szélsejtek két egyenes papillával. Méret: 14—16 μ. Aknaszlatina; sóstavak; VIII. 12.

45. *Scenedesmus ecornis (Ralfs) Chod. (Tab. I. fig. 3).* Sejt elliptikus; mérete: 4—6×6—12 μ. Prohudnya patak völgyében; vízfolyás; VI. 22. VIII. 9.

46. *Scenedesmus acuminatus* (Lagerh.) Chodat (correx. Prof. Dr. Győrffy I.). Sejt kihegyezett. Méret: 4—4.5×18—24 μ. Chuszt; Nagyág; VI. 26., VIII. 8.

47. *Scenedesmus denticulatus Lagerh.* A sejt mindkét vége fogacskával ellátott. Méret: 4—10×6—10 μ. Prohudnya patak völgye; vízfolyás; VI. 22. VIII. 9.

48. *Scenedesmus obliquus (Turpin) Kützing (Tab. I. fig. 4).* Sejtméret: 5—7×25—37 μ. Prohudnya patak völgye; vízfolyás; VIII. 9.

49. *Scenedesmus quadricauda (Turpin) de Brebisson (Tab. I. fig. 14).* A coenobium 4—8 sejtű. Chuszt; Nagyág; VIII. 8.

50. *Ankistrodesmus falcatus var. radiatus (Shodat) Lemm.* Méret: 3×35—37 μ. Ozero tengerszem; VIII. 11. — Aknaszlatina; sóstavak; VIII. 12. — *Var mirabile W. et G. S. West.* A sejtek különbözőképen meggörbülve mindig egyedül állnak. Iza; Nagyág; VI. 26.

51. *Ankistrodesmus lacustris (Chodat) Ostenfeld (Tab. I. fig. 11).* Méret: 3—4×22—23 μ. Orsóformájú sejtek kettesével egy kocsonyaburokban. Aknaszlatina; sóstavak; VIII. 12.

52. *Aktinastrum Hantzschii var. fluviatilis Schröder (Tab. I. fig. 16).* Sejtméret: 3—7×11—20 μ. A sejtek végeikkel érintkeznek. Aknaszlatina; sóstavak; VIII. 12.

5. *Conjugatae.*

53. *Arthrodesmus incus Hass.* Méret: 10—35×22—24 μ. Hegyes tüskékkel. Ozero tengerszem; VIII. 11.

54. *Arthrodesmus triangularis Lagerh. (Tab. I. fig. 40).* A sejtfél trapézformájú. Felső sarok egyenes, vagy kissé befelé tartó tüskékkel. Méret: 18—20×19—21 μ. Ozero tengerszem; VIII. 11.

55. *Closterium aciculare West.* A sejt közepe egyenes, vége elkeskenyedik és elhajlik. Méret: 5—7×300—450 μ. Jaszinya; Bliznica; forrás; VI. 30. — Aknaszlatina; sóstavak; VIII. 12.

56. *Closterium acerosum (Schrank) Ehrbg. (Tab. I. fig. 42).* Sejt végső része elkeskenyedik. Méret: 25—31×250—345 μ. Iza; pocsolya; VI. 26. — Ozeranka patak völgye; vízfolyás; VI. 24. — Aknaszlatina; sóstavak; VIII. 12. Jaszinya; Bliznica; forrás; VI. 28.

57. *Closterium Kützingii Bréb. (Tab. I. fig. 48).* A meghajlott sejt vége elkeskenyedik (megdagadt és lemetszett). Méret: 290—335 ×12—14 μ. Aknaszlatina; sóstavak; VIII. 12.

58. *Closterium lanceolatum Kütz.* Külső oldala konvex, belső egyenes. Méret: 259—270×37—39 μ. Iza; pocsolya; VI. 26. — Ozeranka patak völgye; vízfolyás; VI. 24.

59. *Closterium pseudolunula Borge.* Kissé görbült. Méret: 150 —330×22—30 μ. Husztica; VIII. 8. — Iza; pocsolya; VI. 26. — Rostoka patak völgye; vízfolyás; VI. 24. — Ozeranka patak völgye; vízfolyás; VI. 24. — Aknaszlatina; sóstavak; VIII. 12. — Jaszinya; Bliznica; patak; VI. 28.

60. *Closterium setaceum Ehrbg.* Közepe rövid orsóformájú. Méret: 140—400 μ. ×5—7 μ. Aknaszlatina; sóstavak; VIII. 12.

61. *Closterium Venus Kütz. (Tab. I. fig. 22).* Erősen hajlott; külső oldala konvex. Méret: 45—70×5—10 μ. Jaszinya; Bliznica patak; VI. 28., forrás; VI. 30.

62. *Cosmarium angulosum Brebisson* var. concinnum West *(Tab. I. fig. 37).* A sejtfelek majdnem négyszögletesek. Méret: 20—25 ×15—16 μ. Aknaszlatina; sóstavak; VIII. 12.

63. *Cosmarium bioculatum Brebisson (Tab. I. fig. 36).* Majdnem olyan hosszú, mint széles. Méret: 14—17×13—16 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Ozero tengerszem; VIII. 11.

64. *Cosmarium Blyttii Wille (Tab. I. fig. 45).* A félsejt félköralakú, agy trapézformájú. Méret: 13—16×11—16 μ. Chuszt; Nagyság; VIII. 8. — Aknaszlatina; sóstavak; VIII. 12. — Jaszinya; Bliznica; patak; VI. 28.

65. *Cosmarium de Bary Archer.* Félsejt lekerekített. Méret: 42—45×100—102 μ. Jaszinya; Bliznica; patak; VI. 28.

66. *Cosmarium Botrytis Menegh (Tab. I. fig. 44).* Félsejt pyramisalakú. Méret: 50—55×68—72 μ. Chuszt; Tisza; ártér; VIII. 8. — Aknaszlatina; sóstavak; VIII. 12. — Ozero tengerszem; VIII. 11. — Ozeranka patak völgye; vízfolyás. VI. 24. — Jaszinya; Bliznica; patak; VI. 28.

67. *Cosmarium Brebissonii Menegh.* Félsejt elliptikus; granulumokkal fedett. Méret: 80—100×50—60 μ. Ozero tengerszem; VIII. 11.

68. *Cosmarium cymatopleurum.* Félsejt trapézalakú. Méret: 67—70×50—55 μ. Prohudnya patak völgye; vízfolyás; VI. 22., VIII. 9. — Ozero tengerszem; VIII. 11. — Rostoka patak völgye; vízfolyás; VI. 24.

69. *Cosmarium Kjellmannii Wille.* Félsejt igen széles, szívalakú. Méret: 25×28 μ. Chuszt; Nagyág; VI. 26., VIII. 8.

70. *Cosmarium margaritiferum (Turp) Menegh. (Tab. I. fig. 46).* Széles csonkakúp alakú. Méret: 35—56×45—60 μ. Ozero tengerszem; VIII. 11. — Jaszinya; Bliznica; forrás; VI. 30. — Rostoka patak völgye; vízfolyás; VI. 24.

71. *Cosmarium octodes Nordst.* Félsejt elliptikus. Oldalszegély sűrűn csipkézett. Méret: 50—62×79—80 μ. Jaszinya; Bliznica; patak; VI. 28.

72. *Cosmarium phaseolus Bréb.* Félsejt vesealakú. Méret: 24—35×26—30 μ. Chuszt; Tisza; ártér; VI. 26; VIII. 8.

73. *Cosmarium Pseudobromei Wolle.* Félsejt elliptikus. Méret: 22—38×29—36 μ. Rostoka patak völgye; vízfolyás; VI. 24.

74. *Cosmarium praemorsum Bréb.* Félsejt széles vesealakú. Méret: 30—38×43—54 μ. Jaszinya; Bliznica; patak; VI. 28.

75. *Cosmarium pseudopyramidatum Bréb.* Félsejt csonkakúp alakú. Méret: 20—22×46—50 μ. Jaszinya; Bliznica; patak; VI. 28.

76. *Cosmarium pygmeum Arch. (Tab. I. fig. 39).* Félsejt elliptikus. Méret: 8—10 μ. Chuszt; Nagyág; VIII. 8. — Jaszinya; Bliznica; patak; VI. 28.

77. *Cosmarium pyramidatum Brébisson (Tab. I. fig. 34).* Félsejt pyramisalakú. Méret: 46—47×78—80 μ. Chuszt; Tisza ártér; VI. 26. VIII. 8. — Husztica; VIII. 8. — Ozero tengerszem; VIII. 11. — Rostoka patak völgye; vízfolyás; VI. 24. — Aknaszlatina; sóstavak; VIII. 12. — Jaszinya; Bliznica; patak; VI. 30.

78. *Cosmarium reniforme (Ralfs) Arch.* Vesealakú. Méret: 29—40×36—39 μ. Jaszinya; Bliznica; patak; VI. 28.

79. *Cosmarium undulatum Corda (Tab. I. fig. 47).* Félsejt félköralakú. Oldalt hullámos szegélyű. Chuszt; Nagyág; VIII. 8. — Prohudnya patak völgye; vízfolyás; VIII. 9. — Ozeranka vízfogó; VI. 24. — Aknaszlatina; sóstavak; VIII. 9. — Jaszinya; Bliznica; patak; VI. 28.

80. *Euastrum oblongum (Grew.) Ralfs (Tab. I. fig. 43).* A sejt elliptikus; a két oldallebeny kifejlett. Méret: 40—82×100—162 μ. Ozero tengerszem; VIII. 11.

81. *Pleurotenium Ehrenbergianum var. elongatum (W. West) West et West.* A félsejt vége felé elkeskenyedik. Méret: 18—26×390—400 μ. Ozero tengerszem; VIII. 11. — Aknaszlatina; sóstavak; VIII. 12. Rostoka patak mentén; vízfolyás; VI. 24. *var, rectum (Delph.)*

West et West 12—18 × hosszabb a szélességénél. — Prohudnya patak völgye; vízfolyás; VIII. 9.

82. *Pleurotaenium trabecula (Ehrbg.) Naeg.* A félsejten a basalis hullámon kívül még 2—3 gyenge hullám van. Méret: 85—100×7—14 μ. Prohudnya patak völgye; vízfolyás; VIII. 9.

83. *Staurastrum glabrum (Kütz.) Ralfs (Tab. I. fig. 35).* A félsejt ékalakú, hosszú, egyenes csúccsal. Méret: 25—30 μ. Ozero tengerszem; VIII. 11.

84. *Staurastrum furcigerum Bréb.* (correx. Dr. Kol E.) A félsejt sokszögalakú. Méret: 30—39×35—40 μ. Ozero tengerszem; VIII. 11.

85. *Staurastrum punctulatum.* (correx. Dr. Kol E.) *(Tab. I. fig. 33).* Hosszúkás elliptikus. Méret: 33—35 μ 34—39 μ. Ozero tengerszem felé; patak; VI. 24., VIII. 11.

86. *Staurastrum Pringsheimii Reinsch.* Félsejt elliptikus; majdnem egyenes oldalakkal. Méret: 58—62×60—63 μ. Jaszinya; Bliznica; patak; VI. 28.

87. *Staurastrum pterosporum Lund.* Lekerekített trapézalakú. Méret: 16—24×6—7 μ. Jaszinya; Bliznica; patak; VI. 28.

88. *Staurastrum subcruciatum Cook ét Wills.* A félsejt háromszögletű. Méret: 30—35 μ. Ozero tengerszem; VIII. 11.

89. *Staurastrum tetracerum Ralfs (Tab. I. fig. 38).* A félsejt rövid; négyszögletes. Méret: 18—29×20—26 μ. Ozero tengerszem; VIII. 11.

90. *Xanthidium antilopeum (Bréb.) Kützing* (correx. Dr. Győrffy I. et Dr. Kol E.) *(Tab. I. fig. 41).* A sejtfél hatszögletű. Méret: 50—55 ×62—65 μ. Ozeranka patak völgye; vízfolyás; VI. 24. — Ozero tengerszem; VIII. 11.

Összefoglalás.

Kárpát Ukraina általam vizsgált vizei hydrobiologiai-algologiai szempontból a következőképen csoportosíthatók:

1. A tengerszem és vízfogók.
2. A Tisza, Nagyág, Talabor és mellékpatakjai.
3. „Vízvirágzás“ kifejlődésére alkalmas területek.
   a) Tisza árterülete pocsolyái.
   b) Vízfolyások.
   c) Borvizes patakok.
   d) Hegyi patakok.
   e) Útszéli pocsolyák.
4. Aknaszlatina sóstavai.

1. Az Ozero tengerszem és a vízfogók vize igen érdekes biotopok. Az Ozero tengerszem vize június elején rendkívül hideg volt: 9° C, pH: értéke 7. A tavasszal lehullott sok eső miatt felhígult vízben alig volt egy-két élő szervezet.

Augusztus elején (11-én) a levegő hőmérséklete emelkedésével (25° C) a víz hőfoká is emelkedett (19° C). Egyszerre ugrásszerűen emelkedett a plankton száma. Különösen nagy fajszámmal voltak képviselve a *Conjugata* és *Chlorophyceae* rend tagjai.

A vízfogók vize tulajdonképen átmenet a gyors folyású hegyi patakok és a tengerszem vize között. Az időnként felduzzasztott víz a vízfogókban tóvá szélesedik s míg a zsilipeket meg nem nyitják, lefolyástalan, nyugodt és csendes. Mint ilyen, igen alkalmassá válik, egy-egy algafaj elszaporodásához. Mind a két vízfogónál ugyanezt a jelenséget figyeltem meg. A Rostoka Klauze-nál (aug. 11.) közvetlenül a zsilip mellett *Bacillariaceae* fajok alkottak sárgásbarna lepedéket. Az Ozeranka vízfogónál pedig (június 24-én) *Cyanophyceae* fajok okoztak a vízben kékeszöld elszíneződést.

Megjegyzendő, hogy ezen vízfogókban igen kevés idő áll a „vízvirágzás" kifejlődésére, mert a 4—5 naponként lezúduló víz gyorsan szétmossa a „vízvirágzás"-t, illetve magával ragadja az elszaporodott fajokat. De a zsilipek újabb elzárásával újabb fajok elszaporodása következik be.

2. A Tisza felső folyásánál (Jaszinyától Aknaszlatináig) a hegyi patakokra jellemzően tiszta vizű és igen gyors folyású. Hőmérséklete: júniusban általában 15° C—23° C, augusztusban: 21° C—25° C volt. pH érték nem egyforma: Jaszinyánál: 7.5, Kvaszinál, Rachovnál és Aknaszlatinánál: 8.5, Chusztnál: 7.5.

Vizében feltűnően kevés a plankton szervezetek száma. Benne a *Bacillariaceae* fajokon kívül csupán néhány *Chlorophyceae* faj él. A vízben lévő köveket *Stigeoclonium* gyepek vastag bevonata borítja.

A Nagyág vizének hőmérséklete: júniusban 11° C—20° C; augusztusban 16° C—22° C; pH:7.5 (Chusztnál 8.5). A planktonpróba eredménye valamivel gazdagabb, mint a Tiszáé. A *Chlorophyceae* mellett *Cyanophyceae* és *Conjugata* fajok is megjelentek.

A Talabor vize általában 15° C—19° C; pH:7.5. Vizében feltűnően kevés a plankton: néhány *Cyanophyceae* és *Conjugatae* faj. A *Stigeoclonium* gyepek a köveket vonják be.

3. „Vízvirágzás" kifejlődésére leginkább alkalmas vízterületek:

a) Chusztnál a Tisza árterületén lévő kisebb-nagyobb pocsolyák, melyek a tavaszi áradás után a nagy melegek beálltáig egy ideig fennmaradnak, és igen alkalmasak egyes algafajok elszaporodására. Az erősen felmelegedett vízben (29° C) a szélek mentén, csaknem a fenékig fonalas algák (*Spirogyra, Zygnema, Ulothrix*) fonadékai lepték el a vizet. A *Cyanophyceae* és *Conjugatae* fajok mellett szép számmal éltek a meleg és szennyes vizet kedvelő *Flagellata* fajok is.

b) Gyakran megfigyeltem, hogy a hegyekről lefolyó patakvíz az útmenti mélyedésekben összegyűlve erősen felmelegedik és gyakran több méter hosszúságban fonalas algák szaporodnak el benne. Ezen kisebbfajta „vízvirágzás"-okban nagy számmal élnek a *Chlorophyceae* és *Conjugatae* fajok is.

c) Egészen más jellegű a Kvaszi-i borvizes patakok „vízvirágzás"-a. A jodos-vasas savanyú vizek az útak mentén összegyűlve igen sok helyen „vízvirágzás" jelenik meg bennük, melynek létrehozói főleg a fonalas algák közül kerülnek ki; kísérőjük pedig néhány *Cyanophyceae* faj.

d) A hegyi patakok „vízvirágzás"-a nem annyira a víz, mint inkább a detritus elszíneződésében nyilvánul meg. Igen jó példa erre a Bliznica hegység néhány forrása és patakja. Ezek a különben tiszta vizű patakok vize a lankásabb helyeken megpihen, medrük kiszélesedik és a kissé felmelegedett vízben és a detritusban a fonalas algák és egysejtűek tömegétől zöld színű lepedékes bevonat képződik. Egyedszám tekintetében a *Zygnemales* fajok uralkodnak, a fajok változatossága tekintetében pedig a *Conjugatae* ordo tűnik ki.

e) Gyakori itt is az útszéli pocsolyák „vízvirágzás"-a; ezekben főleg *Cyanophyceae* fajok élnek.

4. Hydrobiologiai szempontból érdekes gyüjtőterület az Aknaszlatina környékén lévő és az elhagyott sóbányák helyén keletkezett sós tavak. Ezen sással és náddal szegélyezett kisebb-nagyobb tavacskák vize erősen felmelegedve (23—29° C) teljesen elszínesedett az egysejtű algák tömegétől. Összehasonlítva az alföldi szikestavak hasonló jelenségével, — kitűnik, hogy a „vízvirágzás" előidézője az erős felmelegedés mellett főként a magas hydrogenionconcentratio (pH érték: 9).

De nemcsak a víz minemüsége, hanem az algaszervezetek szempontjából is igen nagy a hasonlóság a két víz között. Az alföldi szikes vizek „vízvirágzás"-ához hasonlóan, itt is a *Flagellaták* és *Chlorophyceák* az uralkodó fajok, amelyekhez a *Conjugatae* rend tagjai is csatlakoznak.

Vizsgálataim eredményeként megállapítható, hogy a fentnevezett vizek algavegetatioja kifejlődését főként három tényező befolyásolja: 1. a pH érték, 2. a hőmérséklet és 3. a csapadék.

1. A pH érték általában 7—7.5. Ezen érték mellett megállapíthatóan kevés a planktonszervezetek száma. A pH érték emelkedése (pH:8) bizonyos eltolódást idéz elő a planktonban: már nyomokban megjelennek a magasabb pH értéket igénylő *Flagellata* fajok. A 9-es pH értékű vizekben az alföldi szikes vizekhez hasonlóan „vízvirágzás"-ok jelennek meg főként magasabb pH értéket igénylő *Flagellata* fajokkal.

2. Az általam vizsgált Kárpát Ukraina-i folyók vize főleg hideg: 10° C—20° C hőmérsékletű, ezért benne inkább csak a hideg vizet kedvelő fajok (*Chaetophorales, Conjugatae* ordok tagjai) élnek.

3. Az algaszervezetek kifejlődését és elszaporodását nem utolsó sorban befolyásolta a csapadék mennyisége is.

Mint ismeretes, Kárpát Ukraina ezen keleti része igen csapadékos terület. A hegyei szembefekszenek a csapadékot szállító nyugati szelekkel és a nagy magasságkülönbség a levegőt oly nagy felemelkedésre kényszeríti, hogy abból az év minden szakában bőven jut csapadék.

Az 1939—40. év jóval csapadékosabb volt, mint a megelőzőek. Márciusban a csapadék mennyisége több volt, mint a harmincéves átlag. A legnagyobb havi összeget: 206 mm-t Usztcsorna-n észleltek. A csapadék nagy része havaseső és hó alakjában hullott (még a hónap végén is volt hóréteg!).

A hőmérséklet havi középértéke mélyen az átlag alatt maradt. A legnagyobb felmelegedés: 10° C—15° C volt a hónap végén.

A folyók jégpáncéljának felszakadása is csak március 12-e után következett be, mikor is katasztrófális erejű árvizeket okozott.

Mindezek a rendkívüli időjárási viszonyok nagyban hozzájárultak ahhoz, hogy az általam vizsgált Kárpát Ukraina-i folyók vizeiben feltűnően kevés planktonszervezetet találtam. Vizsgálataim során előkerült 90 faj és 4 varietas.

Készült a szegedi Tudományegyetem Általános Növénytani Intézetében; akkori igazgató: Dr. Győrffy István e. ny. r. tanár. — Hálásan köszönöm Dr. Győrffy István professzor úrnak munkámban való értékes irányítását, intézeti és saját könyvtára rendelkezésemre bocsátását; úgyszintén Dr. Kol Erzsébet magántanárnő, intézeti tanárnőnek a fajok revidiálását.

Summary.

The waters of Carpatho-Ukraine which I investigated from hydrobiological-Algal aspect, may be divided as follows:

1. Tarns and sluices
2. The rivers Tisza, Nagyág, Talabor, and their tributary brooks.
3. Territories suitable for the forming of „water blooms", víz.
   a) The pools of the flood-area of the Tisza
   b) accumulated water in flat parts of the brooks,
   c) brooks with mineral waters,
   d) brooks in mountains,
   e) puddles at the road-side,
4. Salt-lakes of and around Aknaszlatina.

1. The Tarn at Ozero and the waters of the sluices form an interesting biotop. The water of the Ozero-tarn was extremely cold early June in 1940 (9° C, pH:7). Owing to heavy Springrains the water was diluted and there was hardly a living organism.

Early August (on the 11 th) owing to the increasing air-tempera ture (25° C) also the water temperature increased (19° C). Suddenly also the number of the planktons increased by leaps. Especially the species of the Conjugata and Chlorophycea were represented in great numbers.

The sluices range between the fast-running mountain-brooks and water of the tarns. Till the sluices are opened, the water swells and it is quiet and has no current. In such condition it forms a rather suitable biotop for the growth of an alga-species.

I observed this phenomenon at two sluices:

At Rostoka Klause (August 11th) inmediately near the sluice Bacillariacea species formed a yellow-brown film, while at the sluice of Ozeranka (June 24th) the Cyanophycea species caused a blue-green colouring of the water.

I must point ont, howewer, that there is very little time for the forming of the „water-bloom" at the sluices, for the water, which is rushing down every 4—5 days, quickly washes away the „water-bloom" and carries away the increased number of species respectively. The renewed closing of the sluices leads to an increased number of new species.

2. The water of the river Tisza has at its upper-course (from Jaszinya to Aknaszlatina) the clearness characteristic for mountain-brooks and it has a very quick current.

The temperature of the water was about 15—23° C in June, and 21—25° C in Agust. The pH values were different. At Jaszinya it was 7.5, at Kvaszi, Rachov and Aknaszlatina 8.5 and at Chuszt 7.5.

The number of the plankton-forming species was remarkably low. I found besides the Bacillariacea species only a few Chlorophycea species. The Stigeoclonium grass formed a thick coating in the water on the stones.

The temperature of the streamlet Nagyág was 11—20° C in June and 16—22° C, in August, pH:7.5—8. The plankton test gave here a somewhat richer result than in the river Tisza. I found besides the Chlorophycea also Cyanophycea and the Conjugata species.

The temperature of the streamlet Talabor was 15—19° C, pH:7.5.

There were remarkably few planktons in its water, only a few Cyanophycea and Conjugata species. The Stigeoclonium formed a coating on the stones.

3. I found water-areas suitable for the forming of the water-bloom".

a) At Chuszt in more or less larger pools in the flood-area of the river Tisza, which lasted a short time after the spring-flood till the beginning of the hot season and were very suitable for the growth of some algae. Twists of filmamentous algae (Spirogyra, Zygnema, Ulothrix) overspread nearly to the bottom along the banks the considerably warm water (29° C). Besides the Cyanophycea and Conjugatae species there appeared in fair number also the Flagellata species which prefer warm and saturated water.

b) I have often made the observation that the water of the brooks, coming from mountains and accumulating in the hollows along the road, gets considerably warm, and often filamentous algae are growing in it in a length of man metres. In these smaller „water-bloom" a large number of Chlorophycea and Conjugata species was found too.

c) Quite a different character had the „water-bloom" of the mineral-water brooks at Kvaszi. The mineral springwater, which contains iodine and iron, accumulated along the roads and formed „water-blooms", caused for the most part by filamentous algae, accompanied by a few Cyanophycea species.

d) The „water-bloom" of the mountain-brooks appears less in the colouring of the water than in that of the detritus. This is exellently proved by some springs and brooks of the Bliznica mountain. The generally clean water of these brooks rests on the flat hillside, its bed expands; the crowd of filamentous algae and of the unicellulars form in the somewhat warm water and in the detritus a green filmy coating. Concerning individuals the Zygnema species played a leading role, regarding variety of the species the Conjugatae excelled.

e) The „water-bloom" of the roadside puddles were here also frequent; they consisted for the most part of Cyanophycea species.

4. The salt lakes of and around Aknaszlatina which were formed in deserted saltmines, constitute an interesting reservoir from hydrobiological aspect. The water of these more or less small lakes, lined with reeds and sedges, and getting considerably warm (23—29° C), got thoroughly coloured by the crowd of unicellular algae. Compared with the similar phenomenom of the sodaie lakes of the Hungarian Lowlands, it becomes evident that the „water-bloom" was initiated (besides powerful warming up), by hydrogenionconcentration (pH value:9).

But there is a great similarity not only owing to the quality of the water, but also concerning the organism of the algae. Similarly to the „water-blooms" of the sodaic waters of the Hungarian Lowlands Flagellata and Chlorophycea species were found, accompanied by Conjugata species.

As a result of my investigations I have ascertained that the Algavegetation of the said waters had been influenced by three factors:

1. by the pH value
2. by the temperature
3. by the rainfall.

1. The pH values average from 7 to 7.5. The number of plankton-organism was relatively small. An increasing value of pH (pH:8) caused a shift in the planktons: there appeared traces of Flagellata-species, which require a higher pH value. Similarly to the sodaic waters of the Lowlands there appeared in the waters of 9 pH value „water-blooms", accompained by Flagellata species, which require higher pH values.

2. The rivers of Carpatho-Ukraine which I had examined, are rather cold (10—20° C); there was a growth of the types which favour cold water (Species of Chaetophora and Conjugata).

3. The growth of the Alga organisms was influenced also by the amount of the rainfall.

It is well-known that this part of Carpatho-Ukraine is very rich in rainfalls. The mountains face the west winds which bring the rainfalls, and the great difference in altitude makes the air ascend to such an extent that there is ample rainfall in every part of the year.

The year 1940 had more rainfalls than the previous years. In March the rainfall averaged more than the average of the preceding 30 years. The greatest montly figure (206 mm) was observed at Usztcsorna, mostly in form of snowy rain or snow; (there was a layer of snow even at the end of March).

The monthly average of the temperature was deep under the average of the preceding years. The temperature was at its highest at the end of the month (10—15° C).

The ice-coat of the rivers did not burst but after March 12th, and caused then catastrophic inundations.

All these extraordinary climatic conditions were to a great extent the cause for the phenomenon that I have found in the waters of Carpatho-Ukraine remarkably few plankton organisms. During my testes I have found 90 species and 4 varietas.

Irodalom.

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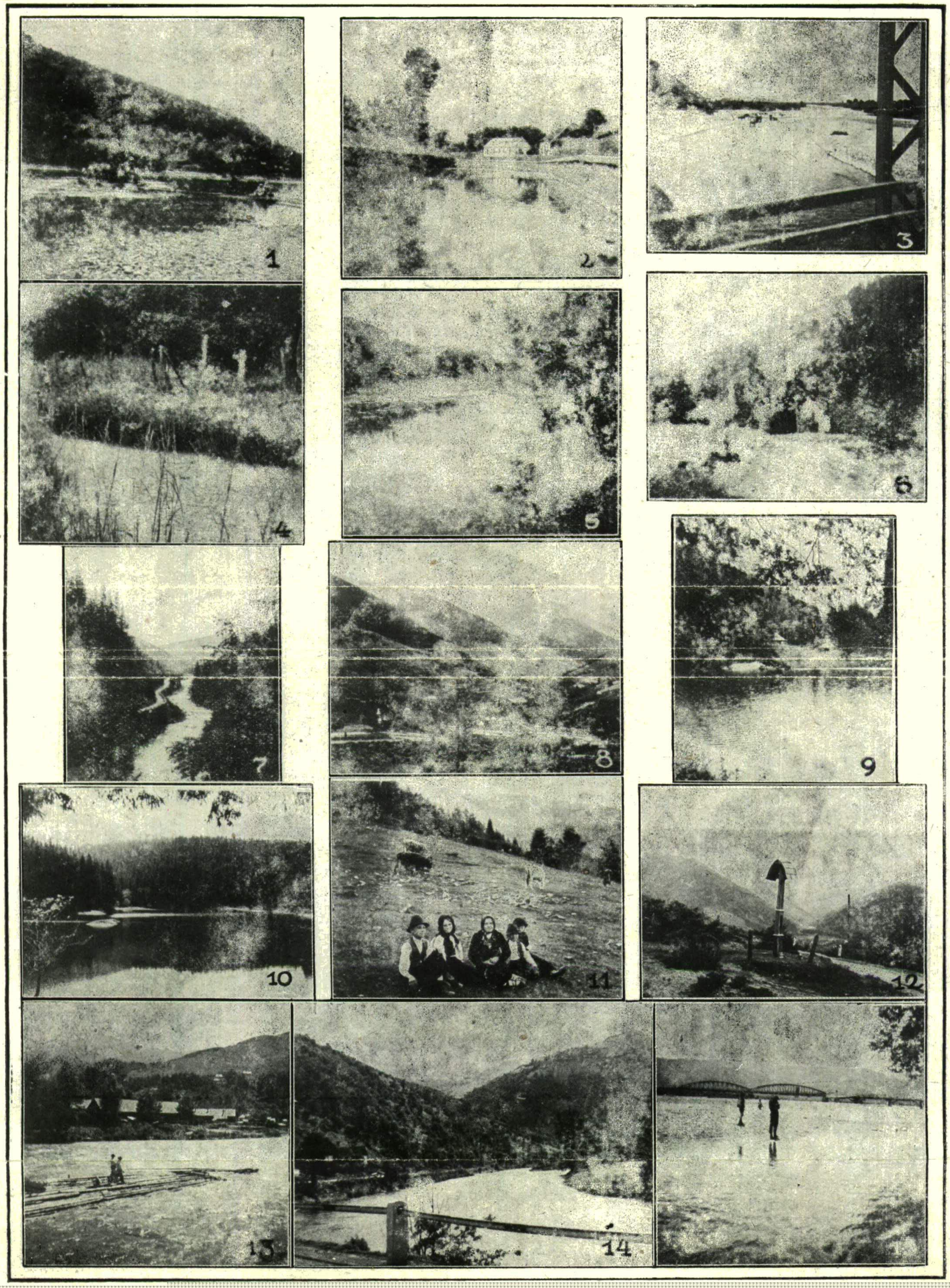
Táblamagyarázat.

Explanation of numbers on the photographs.

Tab. I. fig. 1. *Gomphosphaeria aponina.* 2. *Merismopedia tenuissima.* 3. *Scenedesmus ecornis (Ralfs) Chodat.* 4. *Scenedesmus obliquus.* 5. *Dinobryon sertularia.* 6. *Dinobryon cilindricum.* 7. *Anabaena constricta.* 8. *Oscillatoria limnetica.* 9. *Oscilatoria Agardhii.* 10. *Oscillatoria planktonica.* 11. *Ankistrodesmus lacustris.* 12. *Dinobryon stipitatum.* 13. *Scenedesmus acuminatus.* 14. *Scenedesmus quardicauda.* 15. *Eudorina elegans.* 16. *Aktinastrum Hantzschii var. fluviatilis.* 17. *Sphenocloris urceolata.* 18. *Cryptomonas erosa.* 19. *Lepocinclis Steinii.* 20. *Astasia lagenula.* 21. *Peranema trichophorum.* 22. *Closterium Venus.* 23. *Euglena pisciformis.* 24. *Euglena mutabilis.* 25. *Trachelomonas hispida.* 26. *Euglena granulata.* 27. *Euglena sanguinea.* 28. *Trachelomonas planktonica.* 29. *Euglena viridis.* 30. *Phacus caudata.* 31. *Phacus costatus Conrad.* 32. *Trachelomonas volvocina.* 33. *Staurastrum punktulatum.* 34. *Cosmarium pyramidatum.* 35. *Saturastrum glabrum.* 36. *Cosmarium bioculatum.* 37. *Cosmarium angulosum var concinum.* 38. *Staurastrum tetracerum* 39. *Cosmarium pygmeum.* 40. *Anthrodesmus triangularis.* 41. *Xanthidium antilopeum.* 42. *Closterium acerosum.* 43. *Eastrum oblongum.* 44. *Cosmarium Botrytis.* 45. *Cosmarium Blyttii.* 46. *Cosmarium margaritiferum.* 47. *Cosmarium undulatum.* 48. *Closterium Kützingii. — A fényképek magyarázata — Explanaton of numbers on the photographs.*

Tab. II. phot. 1. *Tisza Chusztnál.* 2. *Husztica patak Chusztnál.* 3. *Nagyág Chusztnál.* 4. *Prohudnya patak Volojevo és Szinevir között.* 5. *Tisza ártere Chusztnál, „vízvirágzás".* 6. *Ozeranka víztogó felé.* 7. *Talabor Szinevirnél.* 8. *Szinevir Poljana.* 9. *Ozero tengerszem.* 10. *Ozero tengerszem.* 11. *Szinevir Poljana-i táj.* 12. *Ozero tengerszem felé.* 13. *Tisza Rachovnál.* 14. *Nagyág Nzs. Bisztránál.* 15. *Tisza Aknaszlatinánál.*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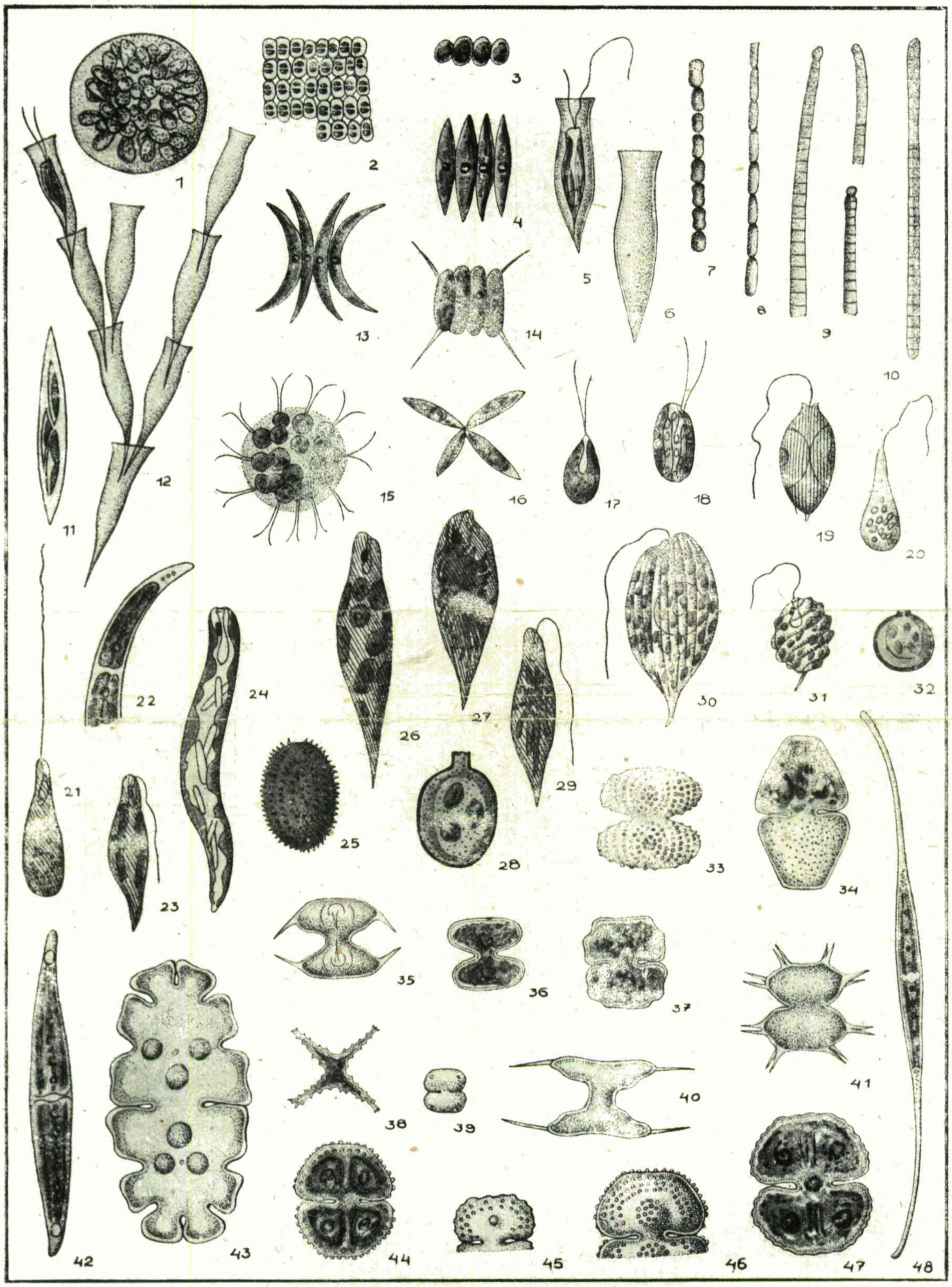
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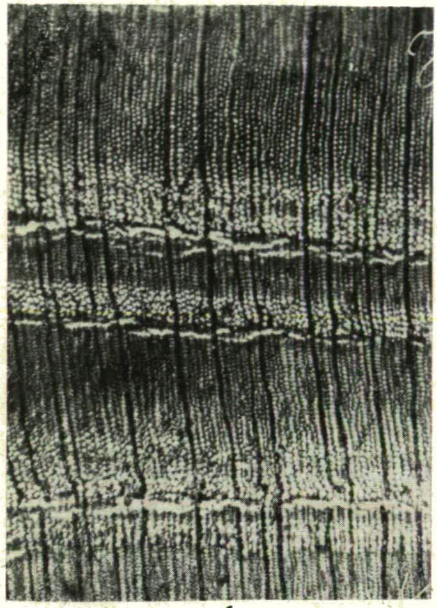
Explanation of numbers on the photographs

1. Cross section (27x)
2. „ „ (103x)
3. Radial „ (183x)
4. Tangential „ (103x)

Explanation of letters on the drawings

a = tracheids (radial side) (340x)
b = rays (thin walled) (340x)
c = tracheids (tang. side) (340x)
f = rays (thick walled) (340x)
i = length parenchyma (340x)
l = trabecula
p = bordered pits

1. *Keteleeria Davidiana* Beiss.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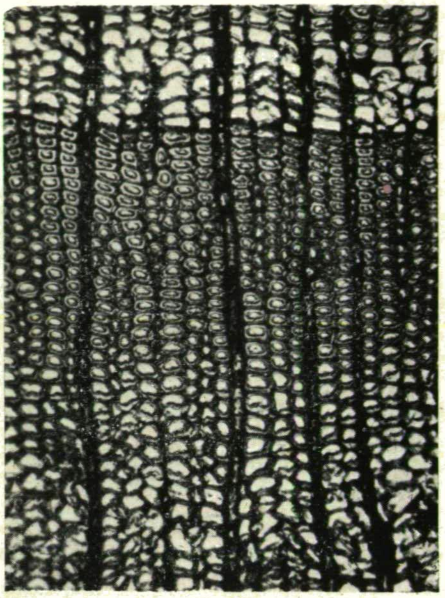
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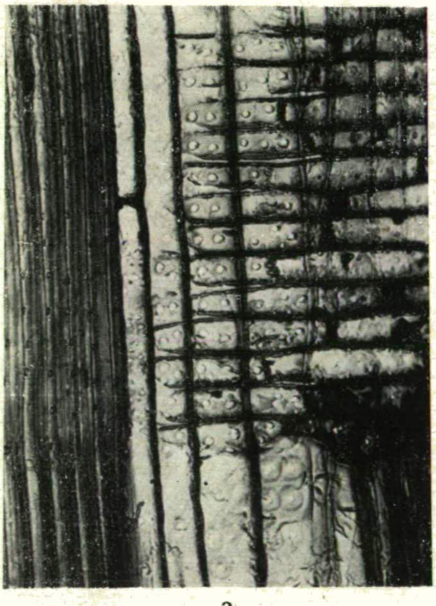
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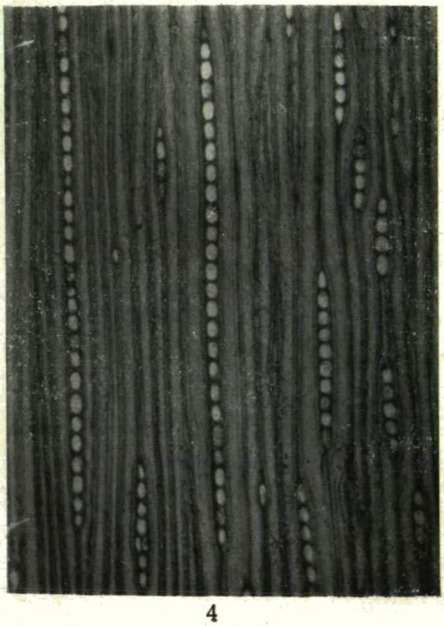
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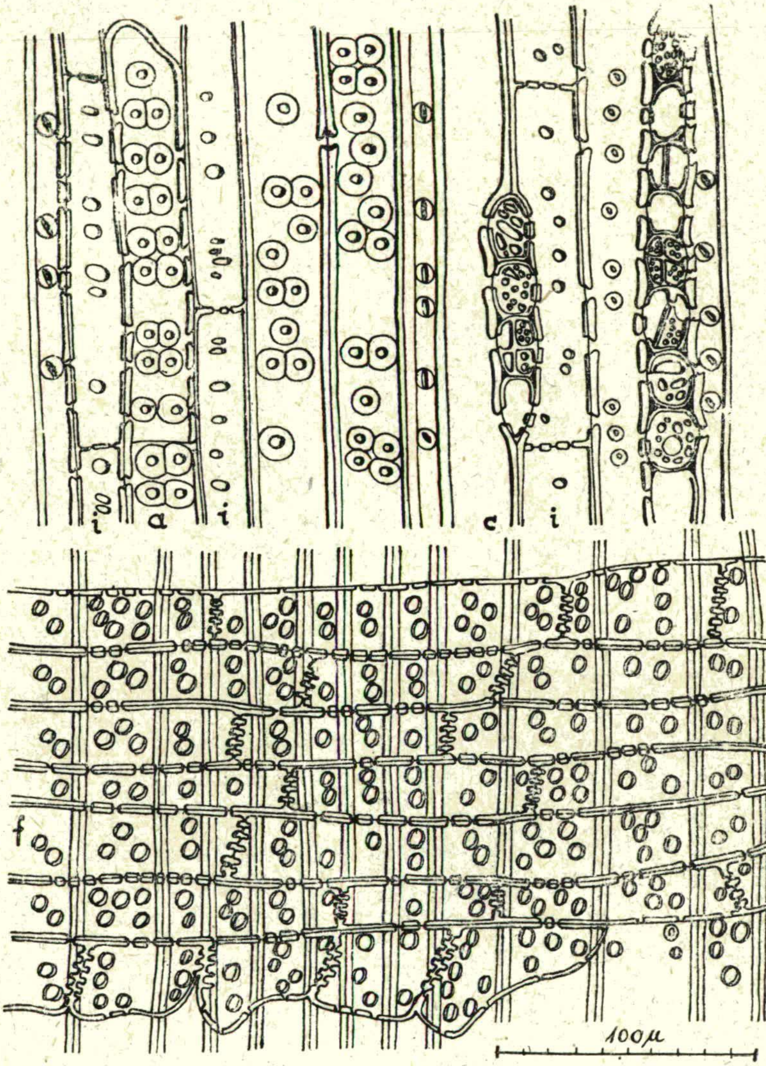
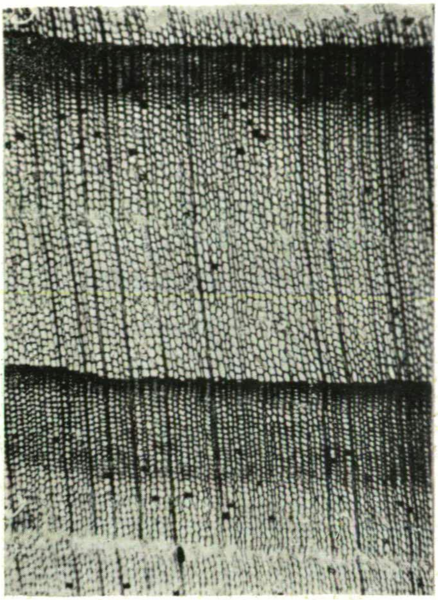
1. *Keteleeria Davidiana* Beiss.



2. *Athrotaxis selaginoides* Zucc.



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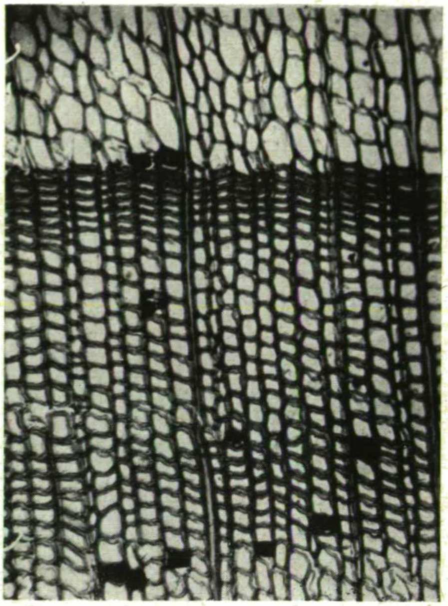

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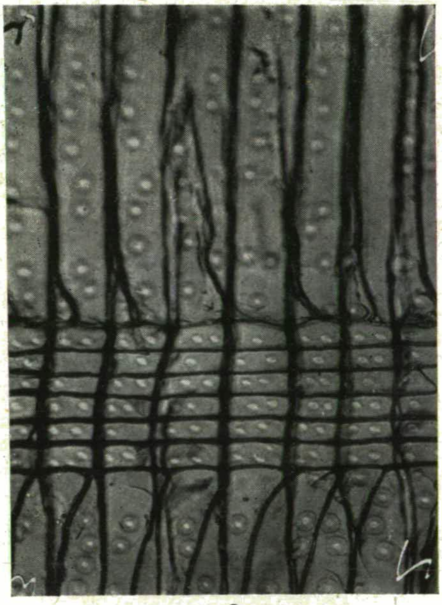

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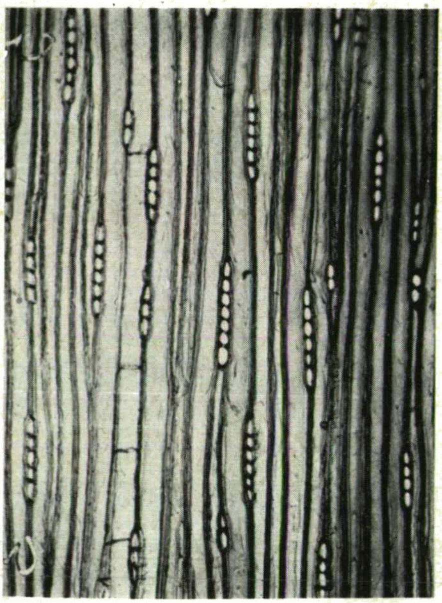

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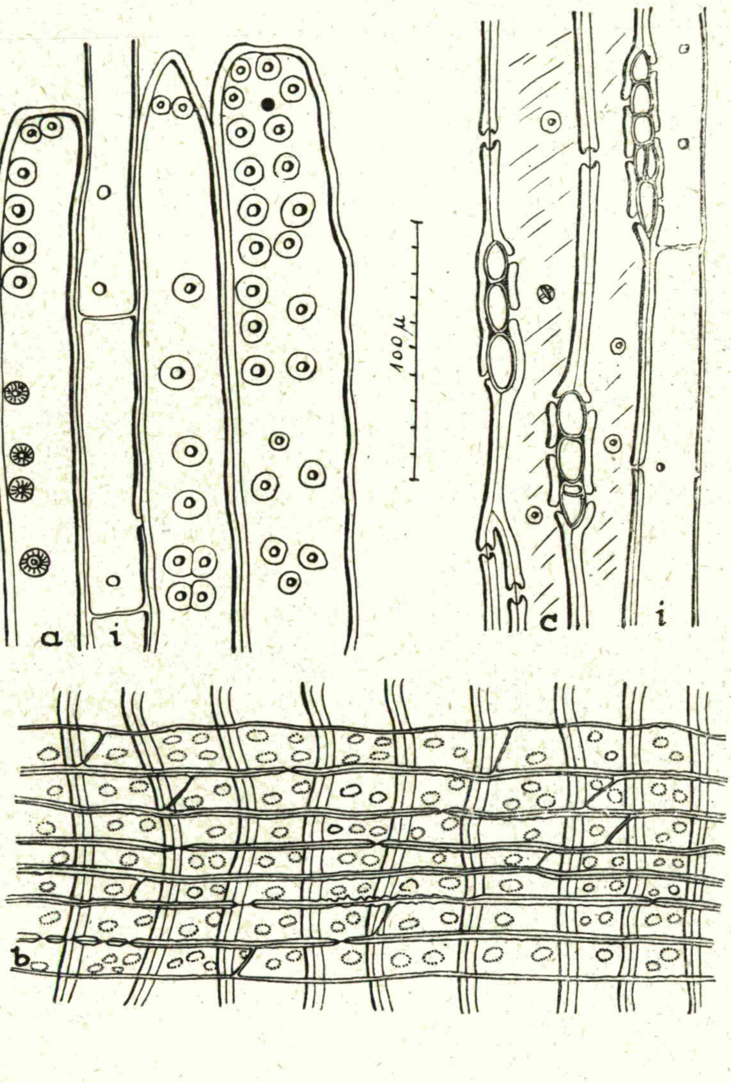
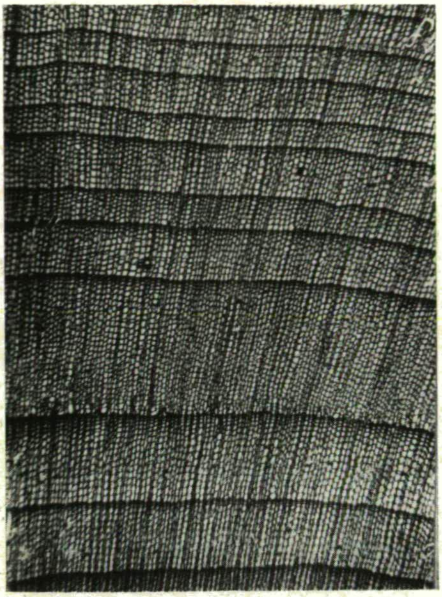
2. *Athrotaxis selaginoides* Zucc.



3. *Glyptostrobus pensilis* (Abel) K. Koch



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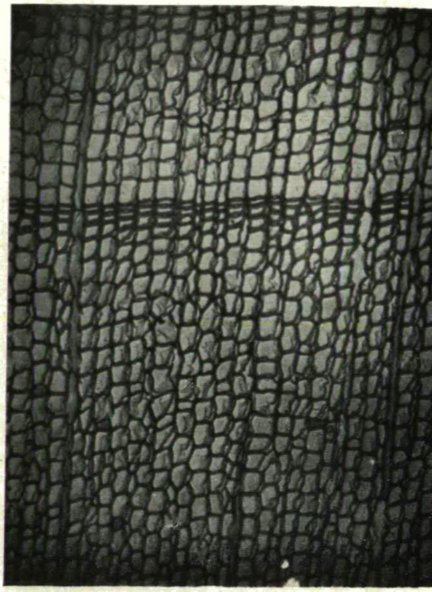

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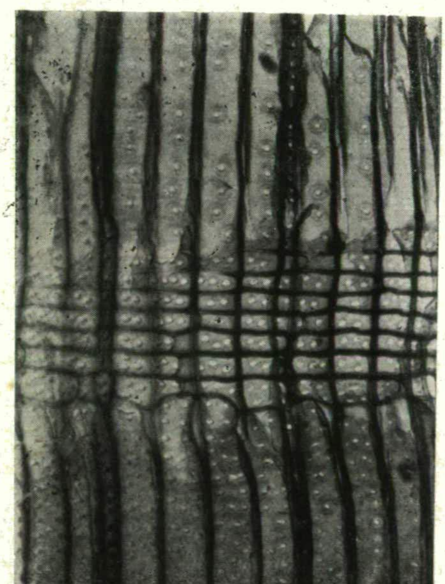

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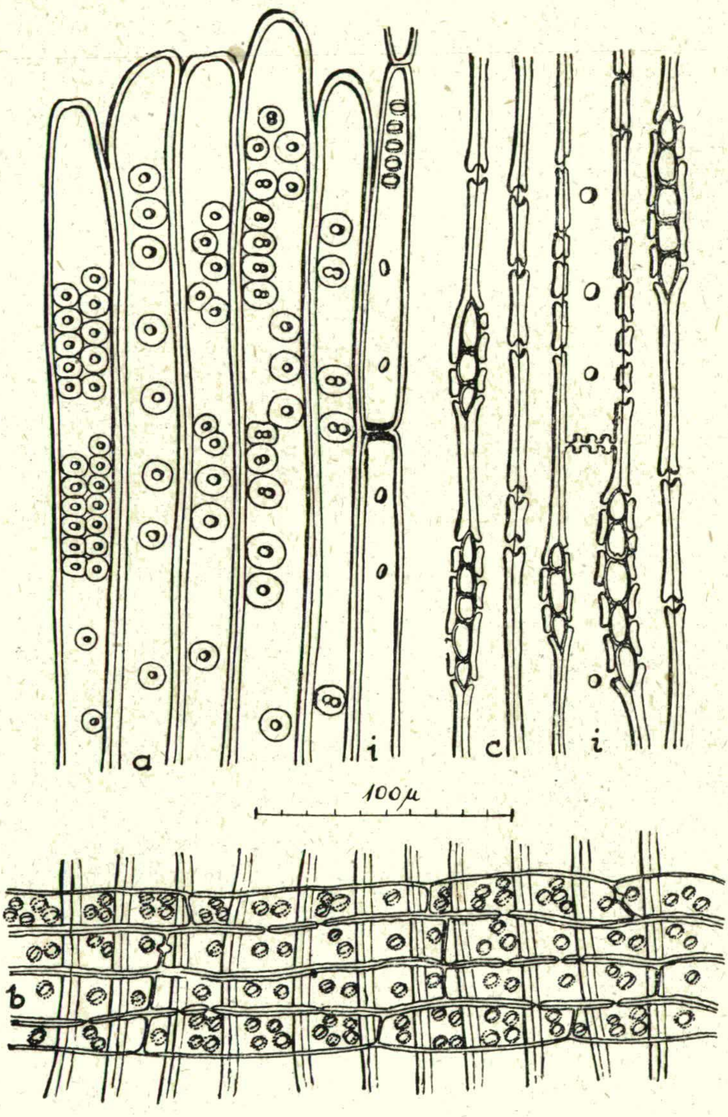
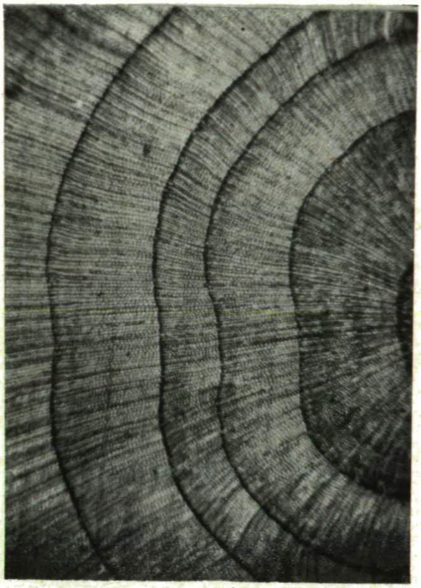


4. *Arceuthos drupacea* Antione



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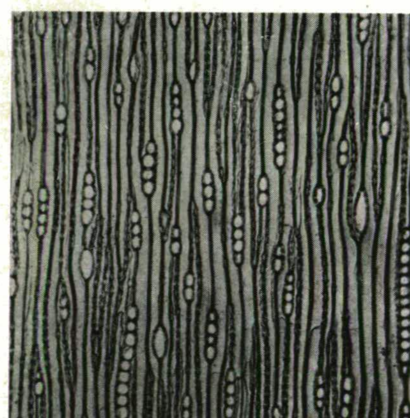

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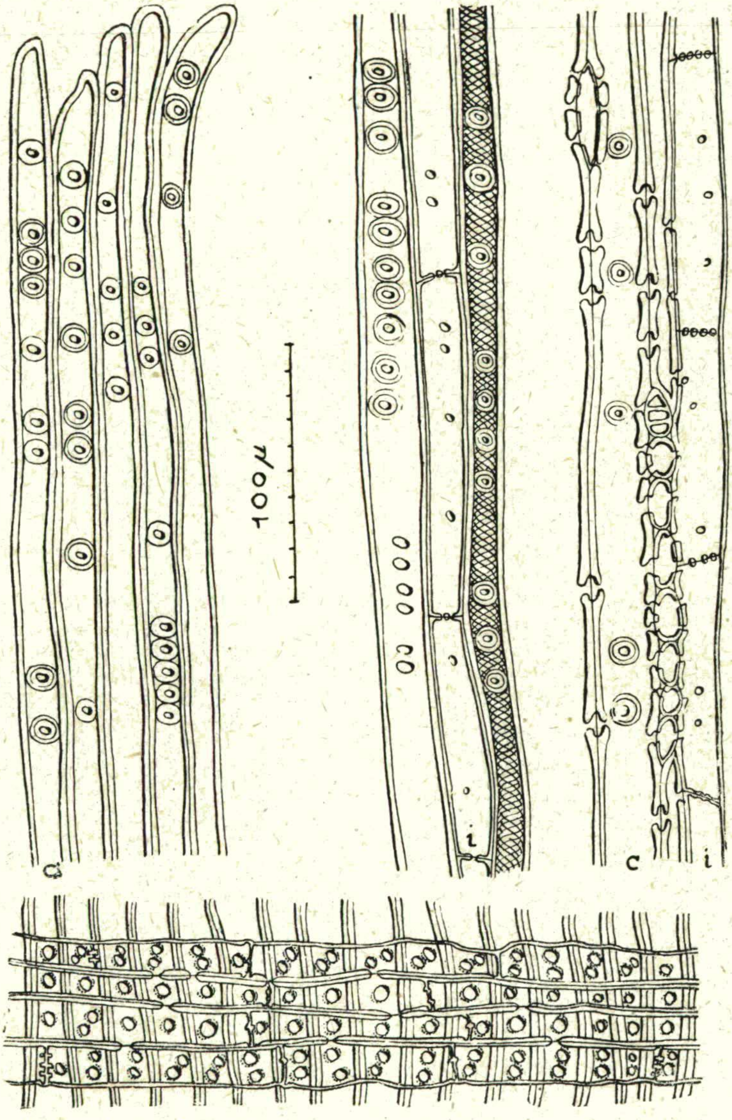
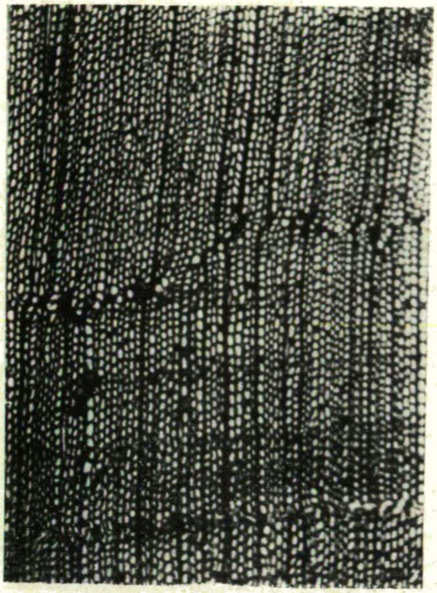


5. *Callitris rhomboidea* R. Br.



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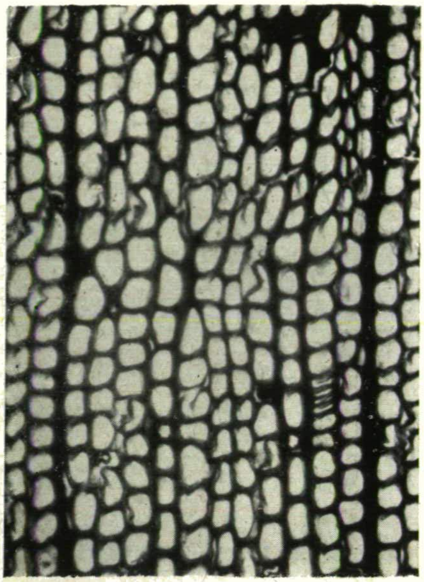

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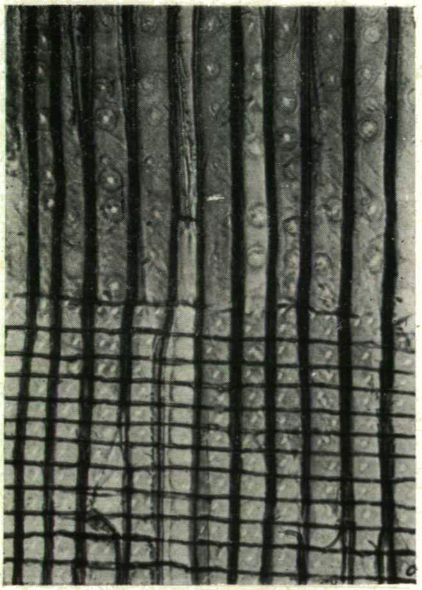

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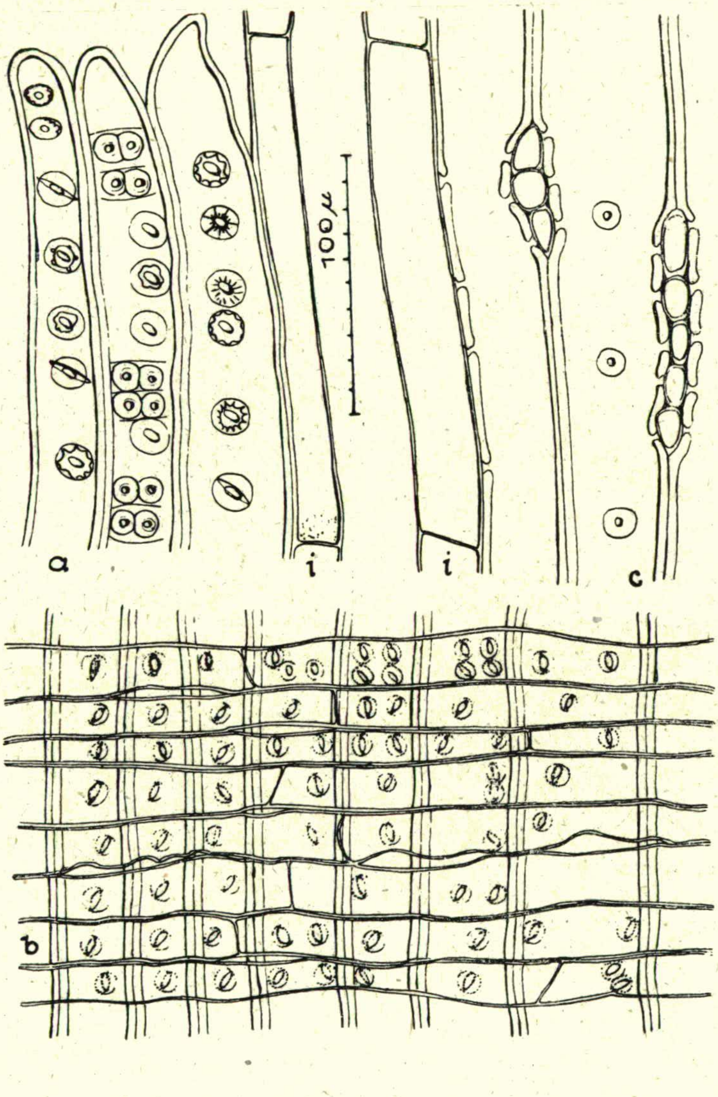
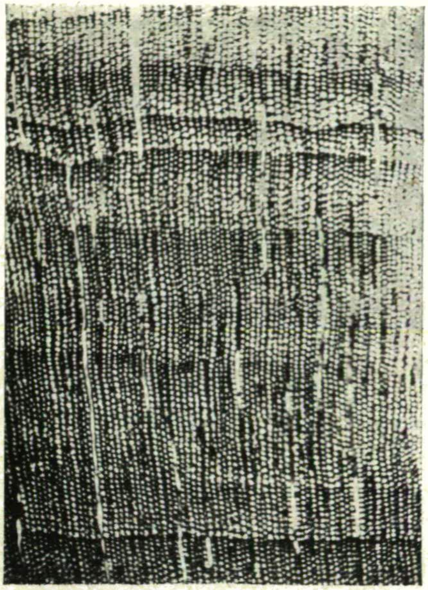


6. Callitropis araucarioides Compton.



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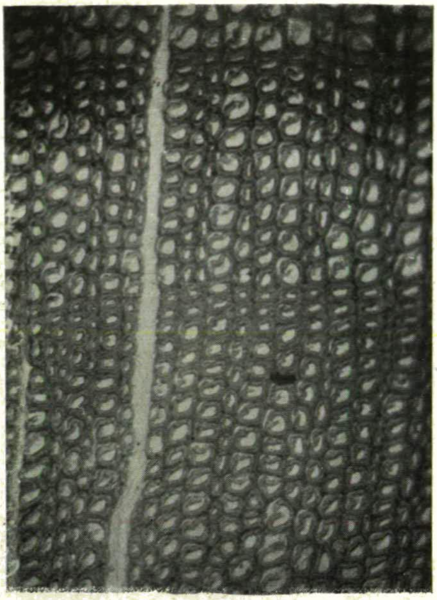

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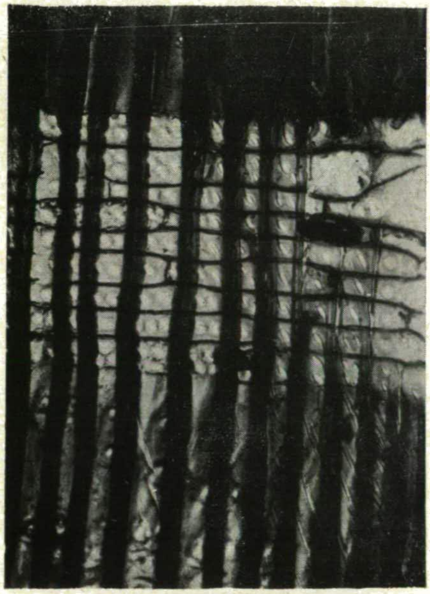

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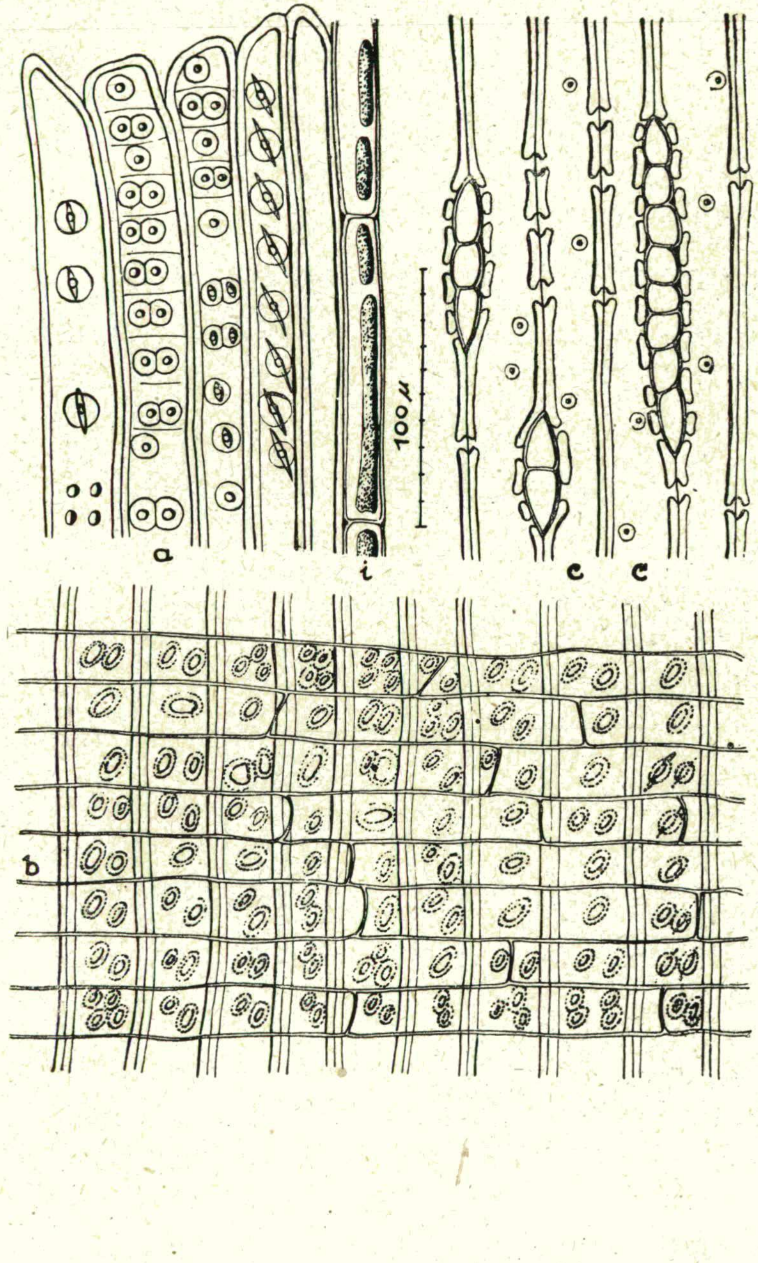
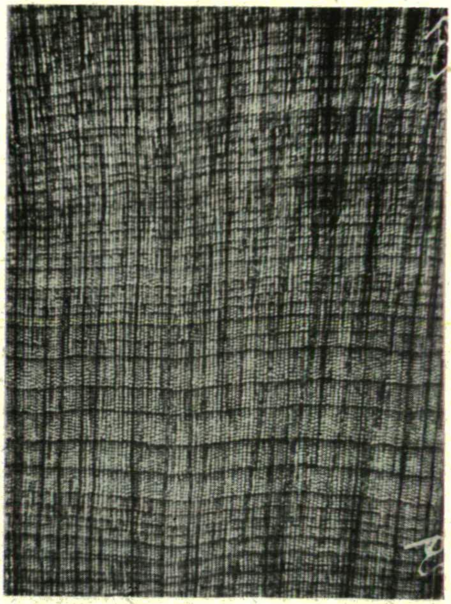


7. *Diselma Archeri Hook. fil.*



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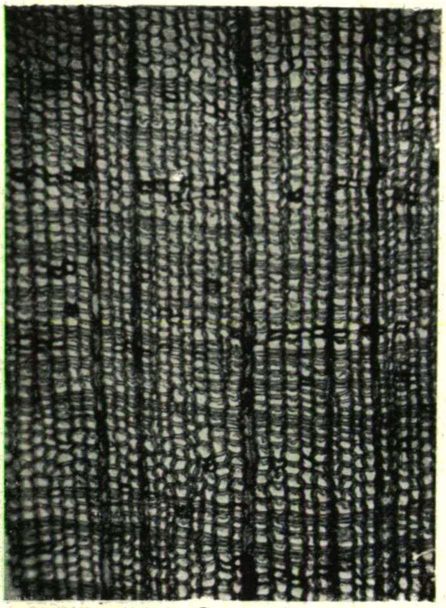

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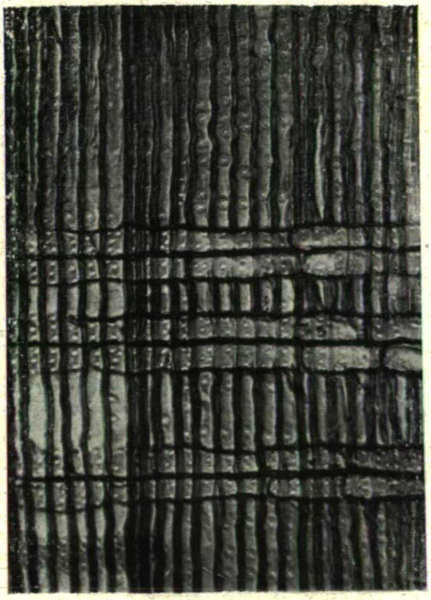

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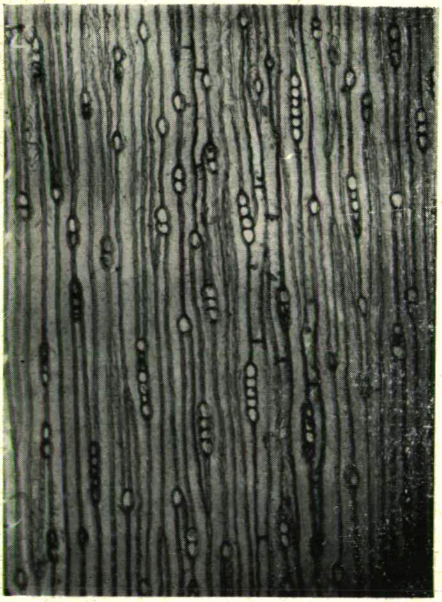

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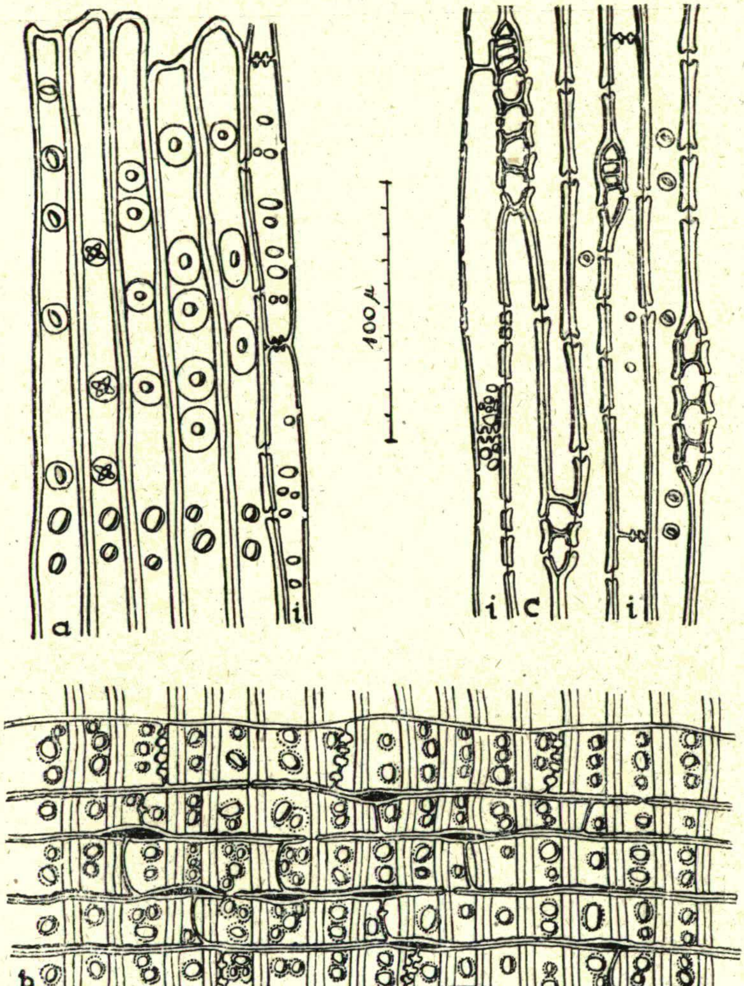
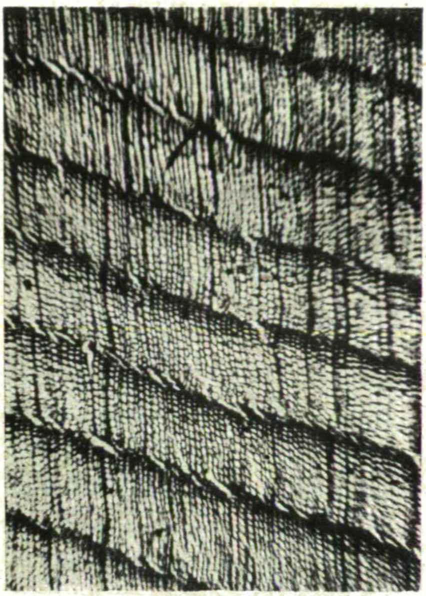


8. *Fitzroya patagonica* Hook.



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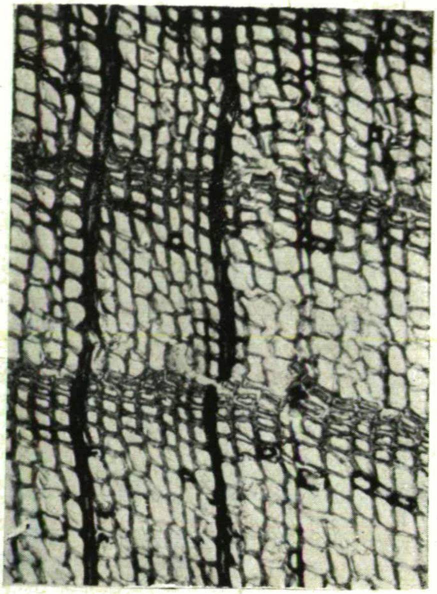

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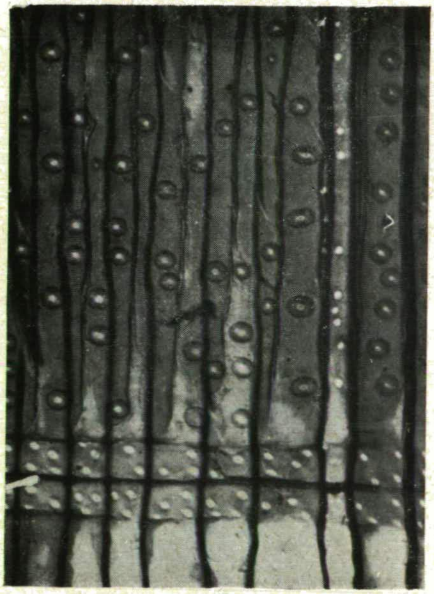

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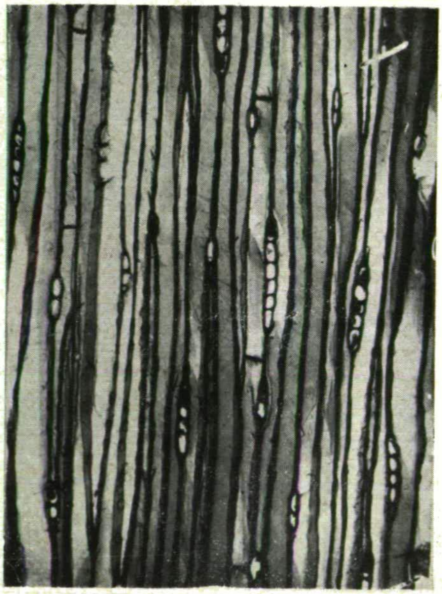

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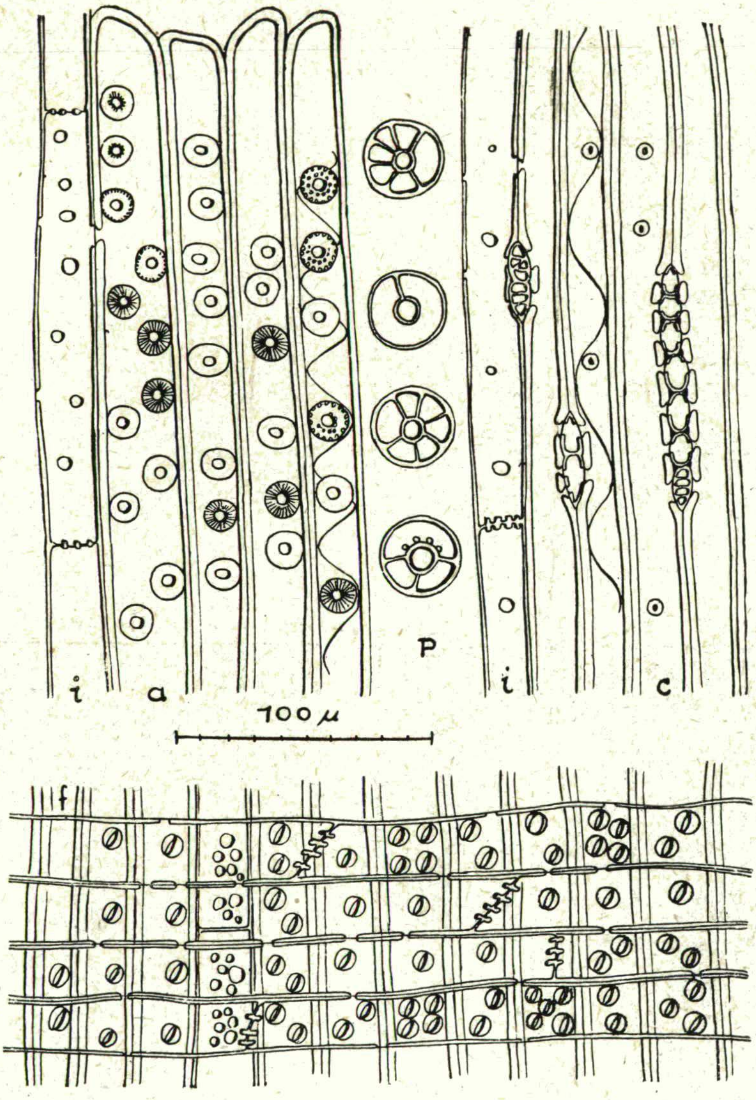
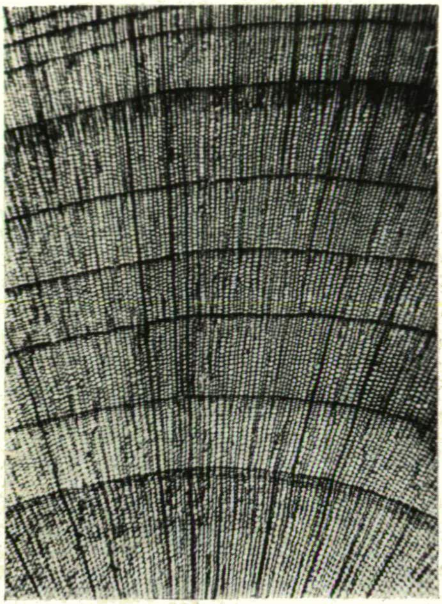


9. *Fokienia Hodginsii* Henry et Th.



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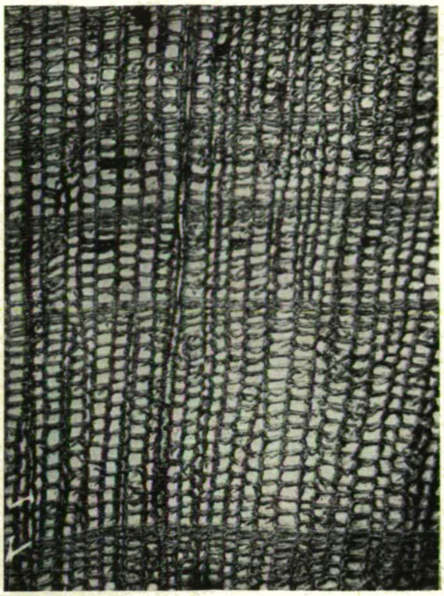

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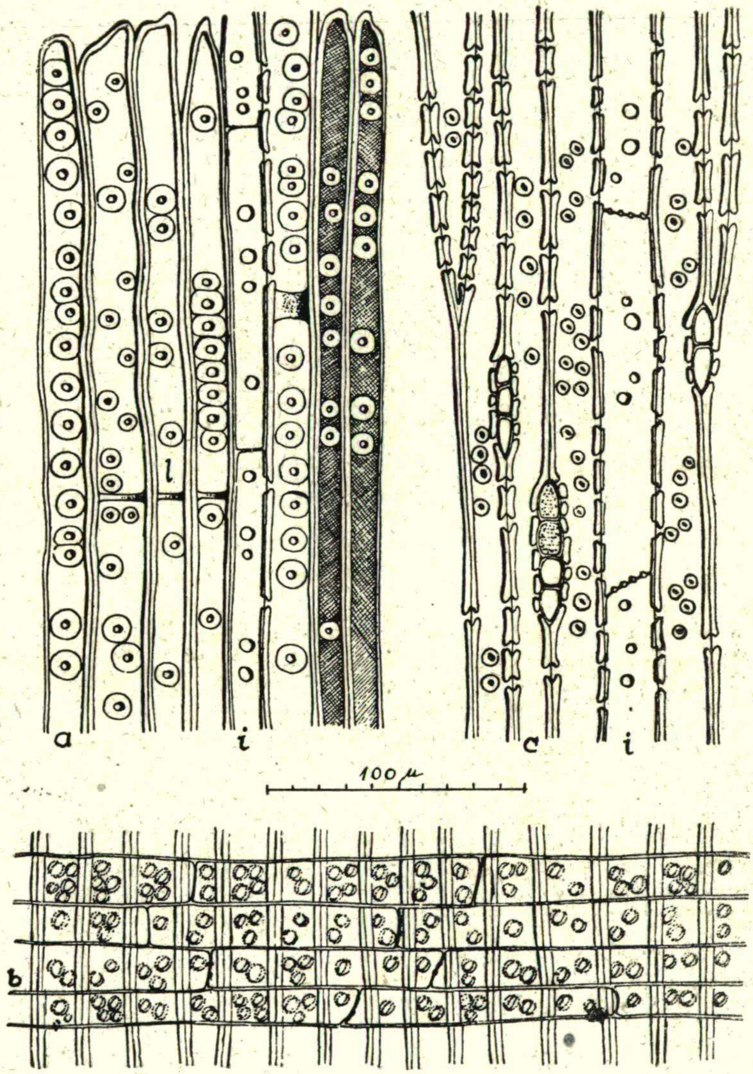
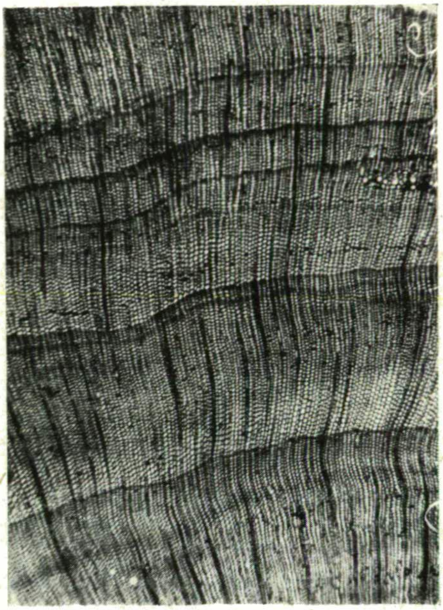


10. Widdringtonia juniperiodes Endl.



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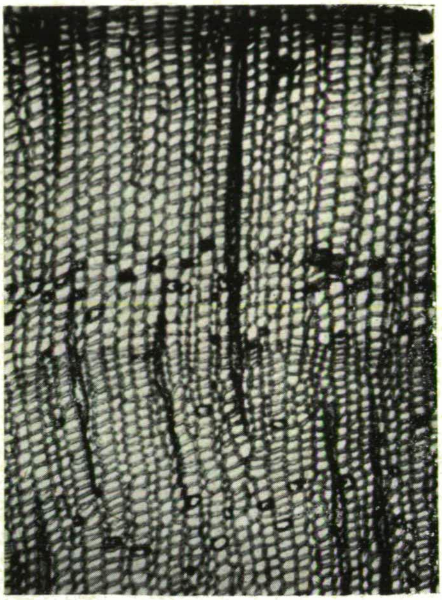

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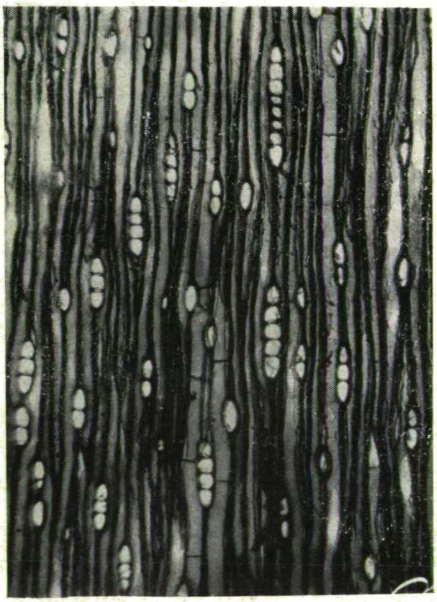

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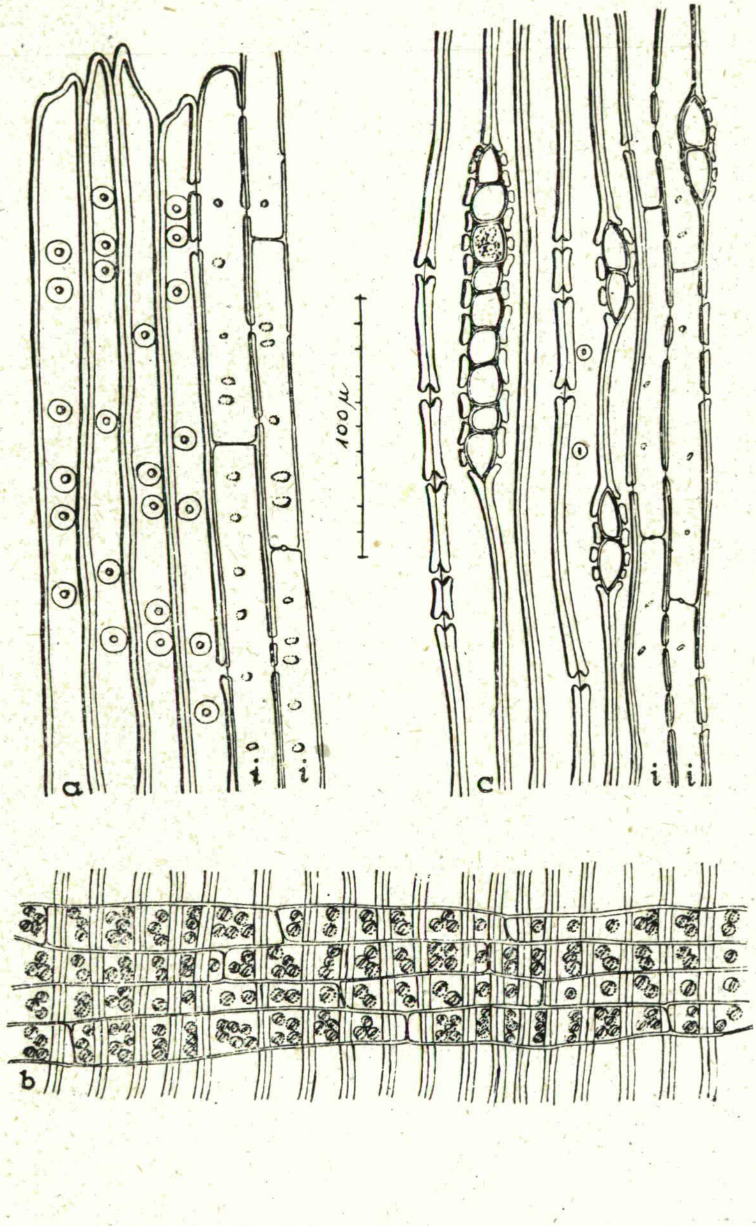
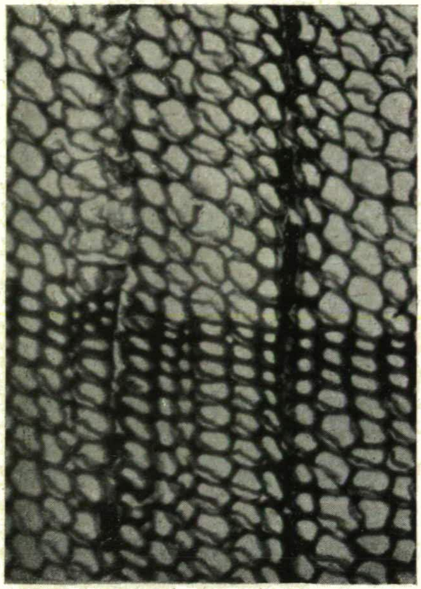
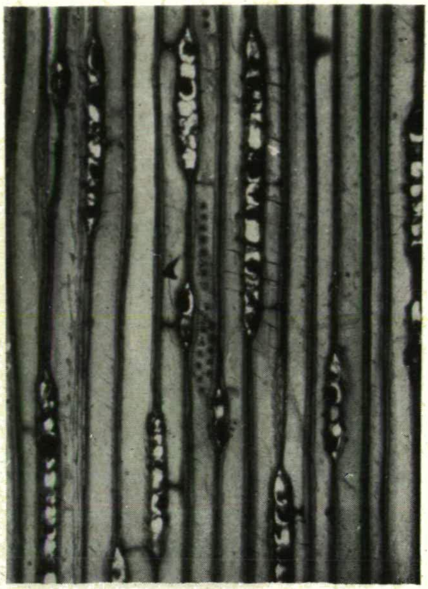
.10. *Widdringtonia juniperiodes* Endl.



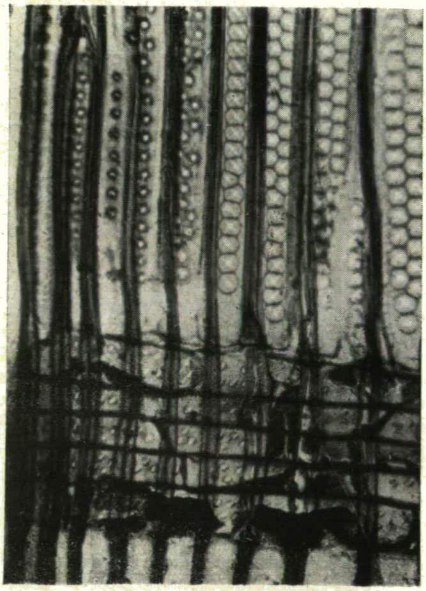
11. Agathis australis Salisb.



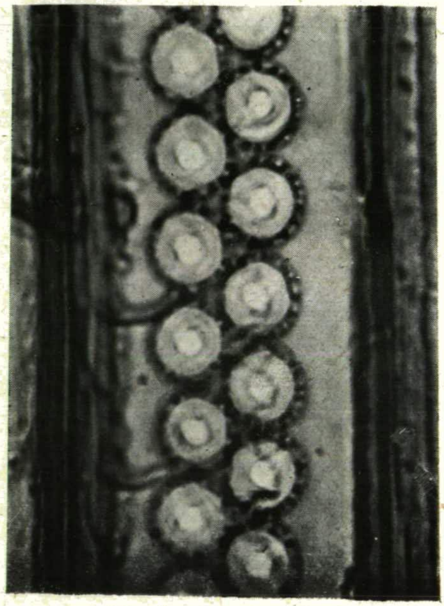
1. Cross sect. (103x)



2. Tang. sect. (103x)

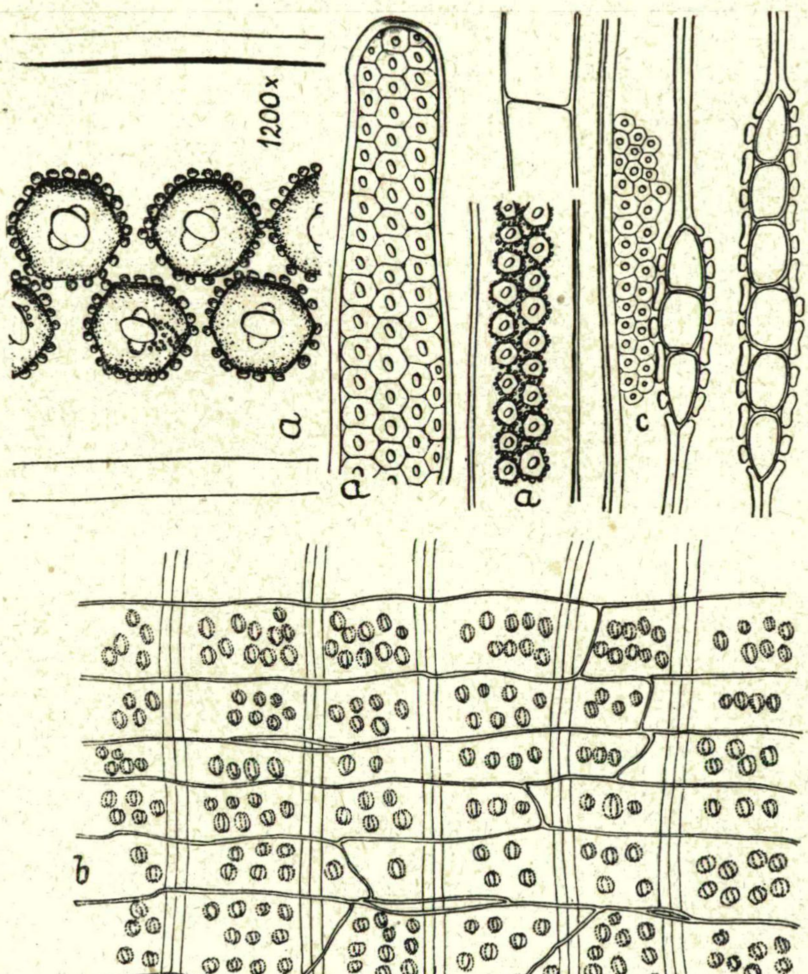


3. Rad. sect. (183x)

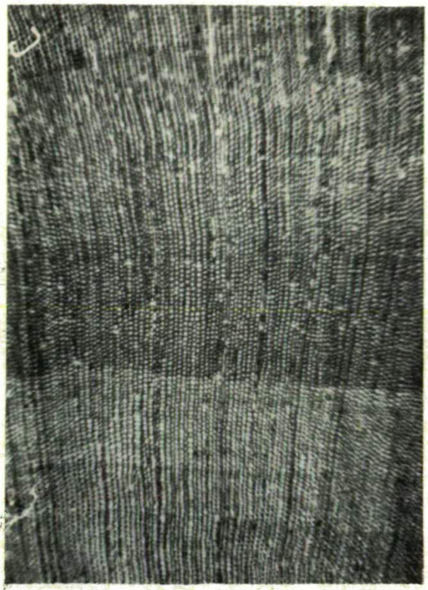


4. Bordered pits. (800x)

11. *Agathis australis* Salisb.



12. Austrotaxus spicata Compt.



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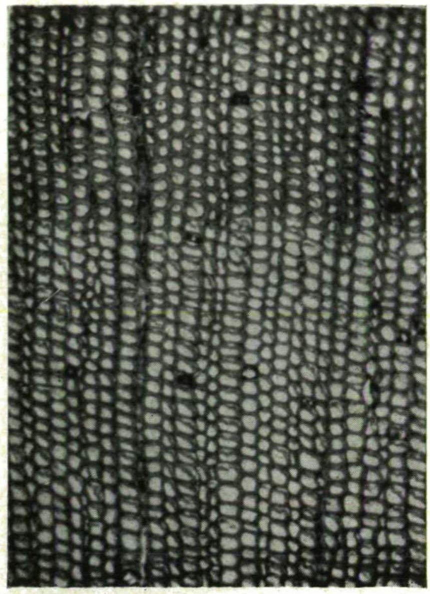

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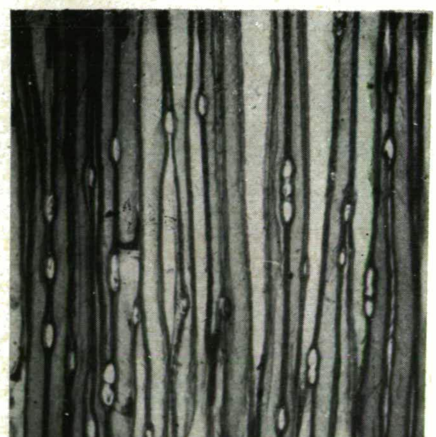

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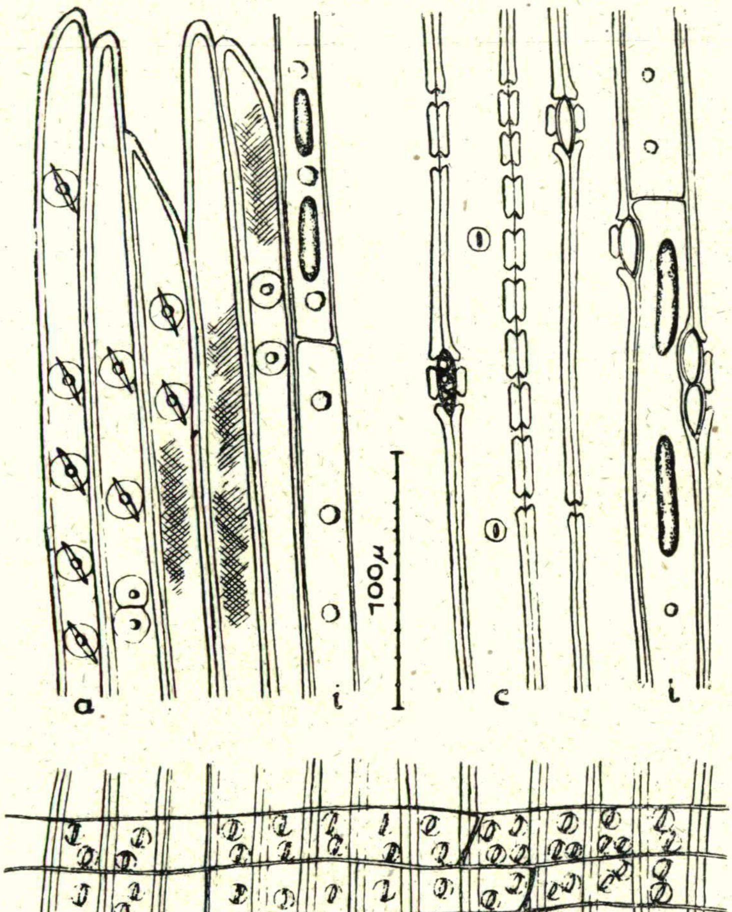
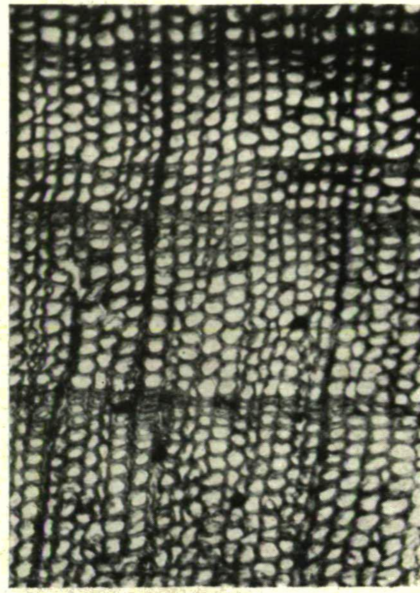
12. Austrotaxus spicata Compt.



13. *Acmopyle Pancheri* Pilger.

1



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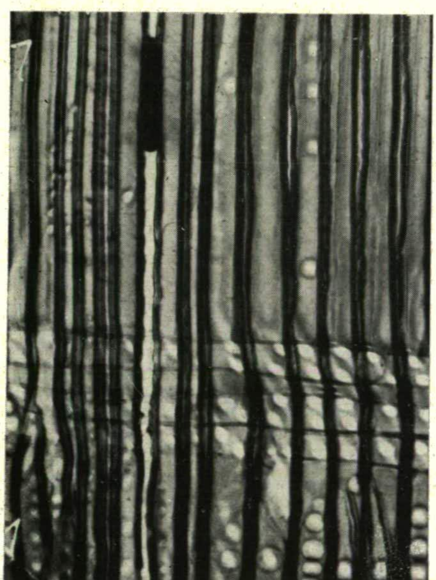
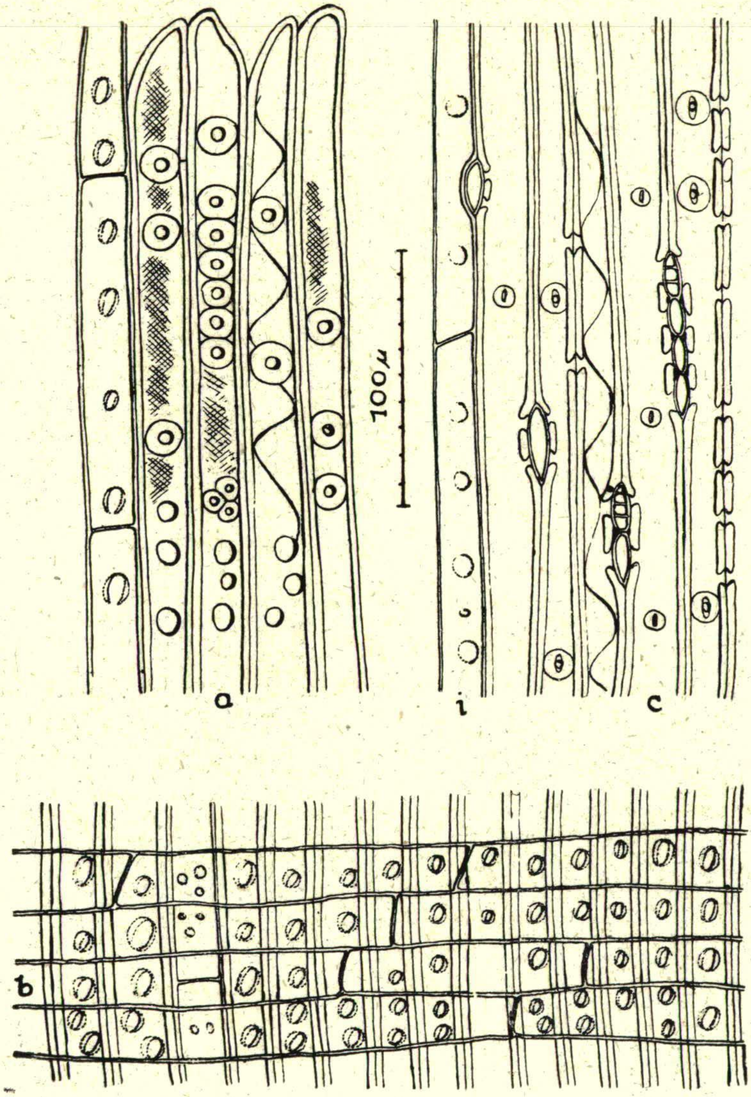


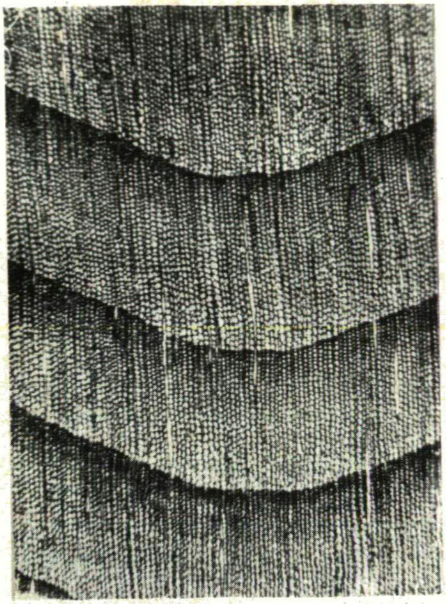
3

4

13. Acmopyle Pancheri Pilger.



14. *Dacrydium Franklinii* Hook. fil.



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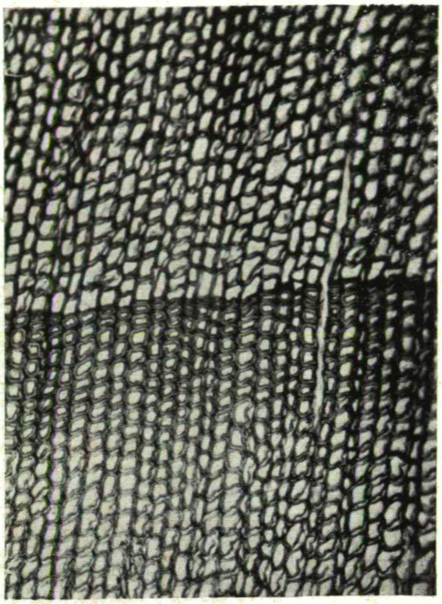

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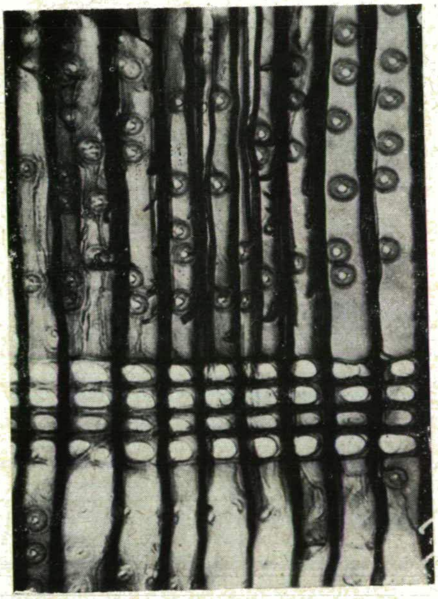
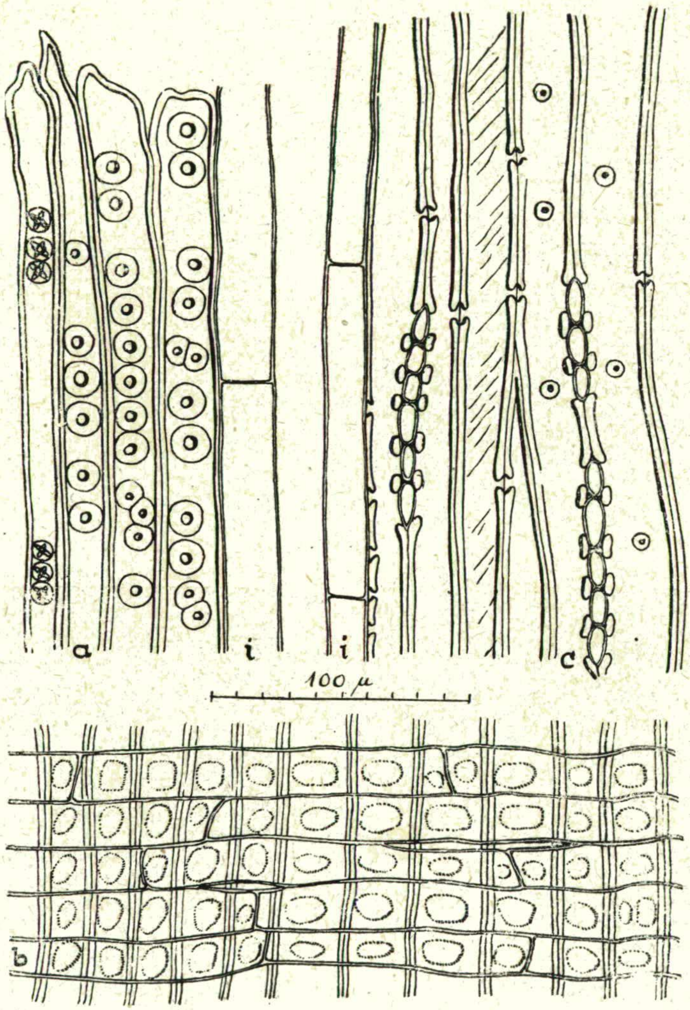


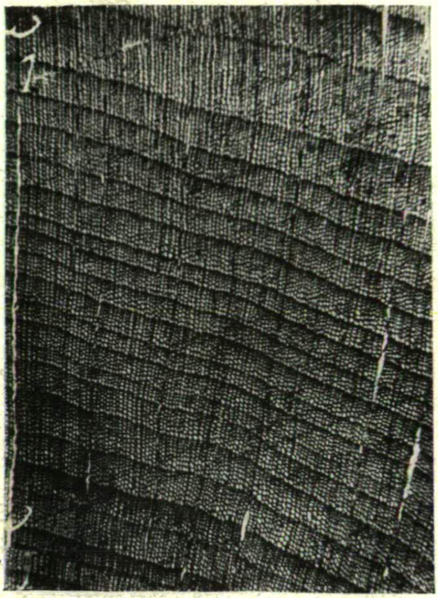
3

4

14. *Dacrydium Franklinii* Hook. fil.



15. Microcachrys tetragona Hook. fil.



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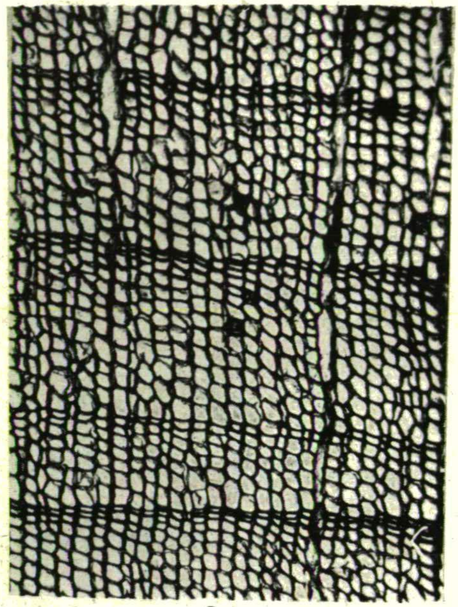
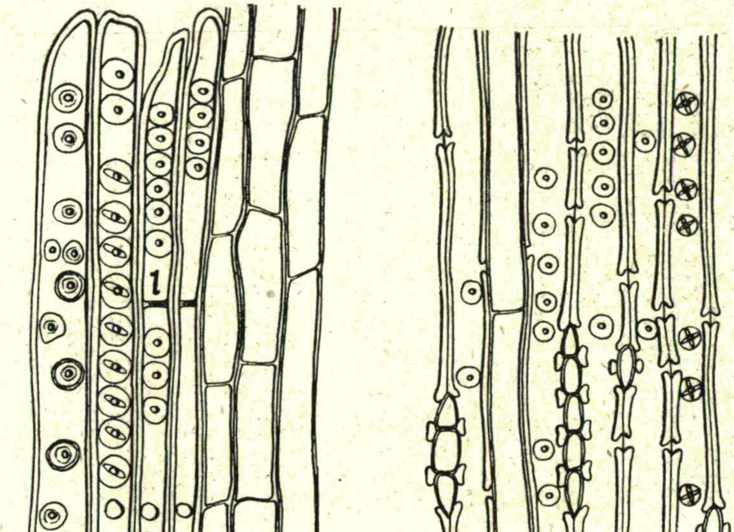


2

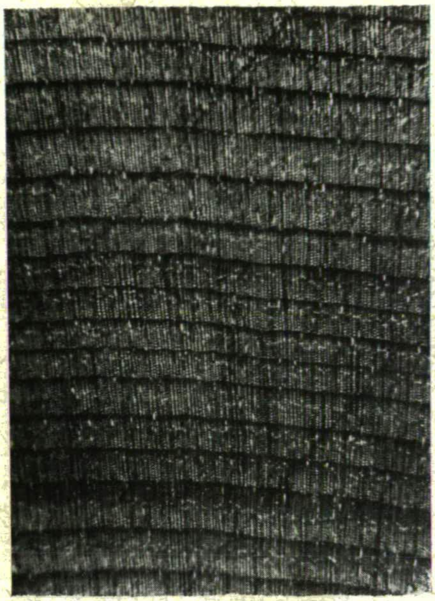
3

4

15. *Microcachrys tetragona Hook. fil.*



16. Pherosphaera Hookeriana Archer.



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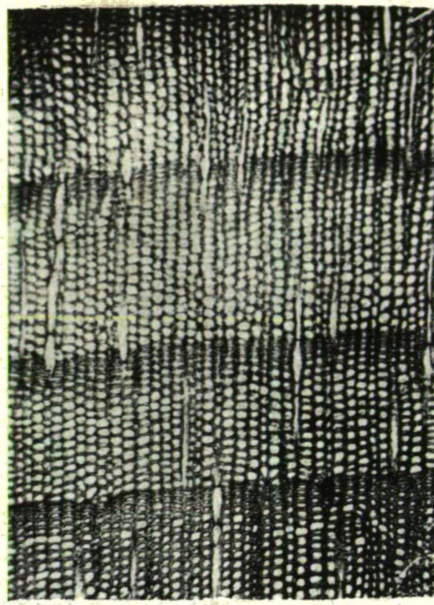

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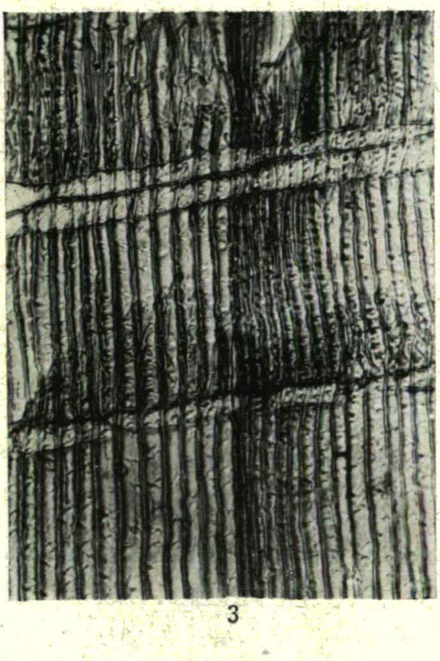

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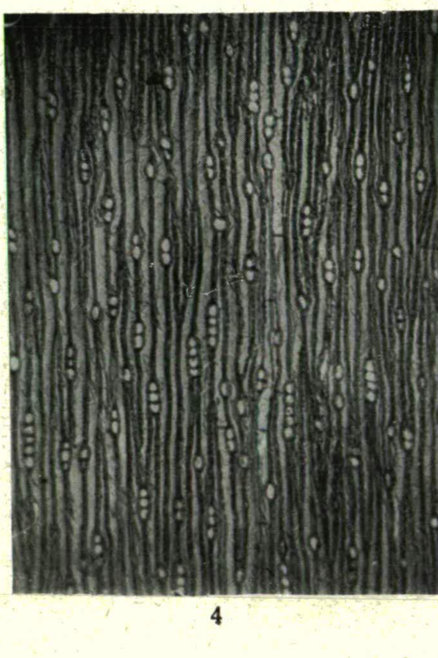

4

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